# TRAVERSE TABLES 

R. L. GURDEN


Civil Enginuering dept

Library


## T R A VERSE TABLES.

NET BOOK.-This book is supplied to the Trade on terms which will not allow of Discount to the Public. CHARLES GRIFFIN \& COMPANY, LTD.

# CHARLES CRIFFIN \& CO.'S PUBLICATIONS. 

In Medium svo. With over 1000 Illustrations. Cloth. 25 s. net.<br>\title{ A MANUAL OF CIVIL ENGINEERING PRACTICE, Specially Arranged for the Use of Municipal and County Engineers. }

By F. NOEL TAYLor, Civil Engineer.


#### Abstract

Contexts.-Orinance Ma ${ }^{1 s}$. - Chain Surveying. - Surveying with Angular lustruments.-Levelling. - Adjusturnt of Instruments.Mensuration of Areas, Volumes, \&c. - The Mechanies of Engineering, \&c.- Deans.-Pillars, Stanclions, and Shafting.-Design of Structures. -Arches.-Graphic Statics.- Materials of Construction. - Engineering Foundations. - Brickwork and Masenry.- Walls.- Constructional Carpentering.-Road Materiqls. - Road Construction.- Reinforced Concrete Construction.-Masonry Bridges and River Work.-Hydraulics. -LamI Drainage.-Pumping Machinery and Stations.-The Use of Water-Power.-Main Drainage. - Sewage Disposal.-Royal Commission on Sewage Disposal. -Salford Sewage Works. - Sanitation, House Drainage and Disialection. - Refuse Disposinl.- Waterworks, Preliminary Considerations and Sources of Supply.-Construction, Filtration and Purification.-Waterworks.-Distribution.-Climneys, Brick and Steel.-Steel Construction : Stanchions, Rivets, and Bolts.-Steel Construction: Beans and Girders.-Combinell Struetures in Iron and Steel. - Specification.-Electric Tramways.-Appendix.-1nDEX. "Packed with facts and formule. . . . Planned on a comprehensive scale. . . the treatment is of a severely practical nature should take its place amongst the most generally useful of civil engineering works."-Scotsman.

Fifth Eition, Revised, with an Additional Chapter on Foundations. Numerous Diagrams, Examples, and Tables Large 8vo. Cloth, 16s.


## THE DESIGN OF STRUCTURES: <br> A Practical Treatise on the Building of Bridges, Roofs, etc.

By S. ANGIIN, C.E.,
Master of Engineering, Regal University ef Ireland, late Whitworth Scholar, etc.
"We can unlesitatingly recommend this work not only to the Student, as the BEST TEXT-BuOK on the sulject, but also to the professional engineer as an exoeedinoly valuable book of reference."-Mechanical World.

Fourth Edition, Thoroughly Revised. Royal 8vo. With numerous Illustrations and Thirteen Lithographic Plates. Handsome Cloth. Price 30s.
A PRACTICAL TREATISE ON BRIDGE-CONSTRUCTION:
Being a Text-Book on the Construction of Bridges in Iron and Steel.
For the Use of Students, Draughtsmen, and Engineers. By 'T. CLAXTON FIDLER, M.Inst.C.E., Pref. of Engineering, University College, Dundee.
"The new edition of Mr Fidler's work will arrain occupy the same conspicuous position among professional text-books aud treatises as has been accorded to its predecessors. The instruction imparted is sound, sImple, AND FULL."-The Engineer.

Second Edition. In Large 8vo. Haudsome Cloth. Beautifully Illustrated. With Plates and Figures in the Text. 21s, net.

## ROAD MAKING AND MAINTENANCE:

A Practical Treatise for Engineers, Surveyors, and Others.
With an Historical Sketcil of Ancient and Modern Practice.
By 'IHOS. AITKEN, Assoc.M.Inst.C.E.,
Member of the Absoctation of Municipal and County Engineera; Member of the Sanitary Inst.; Surveyor to the County Council of Fife, Cupar Division.
With Numerous Plates, Diagrams, and Illustrations.
"The literary style is excellent. . . . A comprehensive and excellent modern book, an up-to-itatis work. . . . Should be on the reference shelf of every Mnnicipal and County Engineer or Surveyor in the United Kingdom, and of every Colonial Engineer." -The Surveyor.
Second Edition. In Large 8vo. Handsome Cloth, Gilt. With 37 Folding Plates and nearly 500 lllustrations. 30 s. net.
THE PRINCIPLES AND PRACTICE OF

## DOCK ENGINEERING.

By BRYsson CUNNINGHAM, B.E., Assoc.M.Inst.C.E., or the Engineer's Department, Mersey Docka and Harbour Board.
Genehal Contents.-Historical and Discursire-Dock Design-Constructive Appliances-Materials-Deck and Quay WallsEntranse Passages and Locks-Jetties, Wharves, and Piers-Dock Gates and Caissons-Transit Shells and Warehouses-Dock BridgesGraving and Repairing Docks-Working Equipment of Docks. - Index.
"We have never seen a more profusely illustrated treatise. It is a most important standard work, and should be in the handa of all dock and harbour engineers."- Steamship.
"A well-arranged and exhaustive treatise on the subject." Enginver.
In Large 8vo. With Folding Plates and Numerous Illustrations. 16s. net.
A COMPANION VOLUME TO "DOCK ENGINEERING."
THE PRINCIPLES AND PRACTICE OF
HARBOUR ENGINEERING.
By BRYSSON CUNNINGHAM, B.E., Assoc.M.Inst.C.E.
Contunys.-Introductory-Harbour Design-Surveying, Marine and Submarine-Piling-Stone, Natural and Artiticial-Breakwater
Design-13reakwater Construction-Pierheads, Quays, and Landing Stages-Entrance Channels-Channel Demarcation.-Index.
"This is a standard work . . . sure to prove a valuable book of reference."-Shipping World.
Third Edition, Thoroughly Revised, Enlarged, and Reset. Large 8vo. Handsome Cloth. With 60 Plates and 71 other lllustrations. 25 s . net.

## HYDRAULIC POWER AND HYDRAULIC MACHINERY. <br> By HENRY ROBINSON, M.Inst.C.E., F.G.S.

"The standard work on the applications of water power. . . . Comprehensive, enbbracing and handling in a very concise manner the numerous subdivisions of this wide subject."-Cassier's Afagazine.

Complete Catalogue of Works on CLASSICS, ENGINEERING, MINING, METALLURGY,
TECHNICAL INDUSTRIES, MEDICINE, SANITATION, etc.,
TECHNICAL INDUSTRIES, MEDICINE, SANITATION, etc.,
POST FREE ON APPLICATION.
LONDON: CHARLES GRIFFIN \& COMPANY, Ltd., Exeter Street, Strand.

# TRAVERSE TABLES: 

COMPUTED TO 4 PLACES DECIMALS FOR EVERY" OF ANGJE UP TO 100 OF DISTANCE.

FOR THE USE OF

## SURVEYORS AND ENGINEERS.

BY

RICHARD LLOYD GURDEN, FORMERLY AUTHORISED SURVEYOR<br>For

THE GOVERNMENTS OF NEW SOUTH WALES AND VICTORIA.

Published with Concurrence of the Surveyors-General for New South Wales and Victoria.

## đentb $\mathbb{E}$ dition.

```
LONDON:
CHARLES GRIFFIN AND COMPANY, LIMITED. ExETER STREET, Strand.
1914.
[All Rights Reserved.]
```

$$
\begin{gathered}
f \text { TA552 } \\
G 88 \\
1914
\end{gathered}
$$



人 2

## I NTRODUCTION.

INN offering the present Volume to the consideration of his brother Surveyors, the Author would simply remark, that it owes its existence to his own felt want of such a compilation.

Whilst occupied on the Government Survey of Victoria, the inadequacy for practical purposes of the existing published Computations forced itself so strongly upon him, that he resolved, notwithstanding the pressure of professional engagements, to prepare a set of Traverse Tables which should more nearly answer both his own requirements and those of his colleagues-a determination which has resulted in the publication of the ensuing pages.

The Distinctive Features of these Tables, and the method of their employment, may be briefly summarised as follows :-
I. The Tables are calculated to Single Minutes and to 100 of Distance.
11. The Traverses are given to four places of decimals, so that the Sines and Cosines for a distance of twelve miles can be ascertained correctly to within half an inch.

1II. The angles o to $45^{\circ}$ are given at the top of the page, and $45^{\circ}$ to $90^{\circ}$ at the foot; the distances 1 to 100 are in the outside columns; and the quantity sought is found at the intersection of the column containing the required angle and the line on which is the required distance.
IV. The whole numbers are given in the two centre columns only, and from these the decimal quantities increase towards the edge of the page, the Sines increasing to the right, and the Cosines to the left. When the whole number changes in the line, attention is directed to it by a black diamond ; therefore, when a black diamond is found, it is to be understood that it signifies a cipher, and that the whole number of that value (i.e. containing the diamond), and all to the right on the same line, must be increased by one. For example :-

|  |  | Cos. | Sin. |
| :--- | :--- | :---: | :---: |
| $0^{\circ} 42^{\prime}$ dist. 81 | $80^{\circ} .9940$ | 81.9896 |  |
| $0^{\circ} 43^{\prime}$ | $\prime 1$ | 81 | $80^{\circ} 9937$ |
| $0^{\circ} 44^{\prime}$ | , 1 | 81 | $80^{\circ} .9934$ |

The simplicity of this plan has so many advantages, that, in the Author's opinion, it more than counterbalances the commoner one of repeating the whole numbers at the outside of the page as well as in the centre.
V. In the following Table, the whole of the figures required to be written for the finding of Sines and Cosines are shown in a circuit of twelve lines:-


The angles sought in the Tables are those under the head "Reduced Bearing."
For the first line, opening the Tables at $89^{\circ} 44^{\prime}$ :

the results are carried into the S . and E. columns.
In the next line, the book is opened at $63^{\circ} 27$, and for Distance $4^{\circ} 60$ chs. The Cosine and Sine are found at once, and copied into the N. and E. columns.
in the third line, the book is opened at $16^{\circ} 28$, and at a Distance 100:
the Cosine and Sine copied,
958.99 and 283.46
then for 22 lks ., .
and these being added up, . . . . . . $\overline{980 \cdot 09} \overline{28970}$
the results are carried into the N. and E. columns.
The trifling calculation required is shown in full in the columns "Latitude" and "Departure," that for each line being comprised in one page of the book

V1. The great advantage of these Traverse Tables over Logarithms-both as regards simplicity and economy of labour in calculating-will be seen at a glance from the following comparative Table:-

| TIO | By TRAVERSE TABLES. By LOGARITHMS. | ES AND COSINES. By LOGARITHMS. |
| :---: | :---: | :---: |
| $63^{2} 27^{\prime}-4600$ links. | $\begin{aligned} & 2056.10-4114 \cdot 91 \\ & \text { One opening of Traverse Tables. } \\ & \text { No calculation required. } \end{aligned}$ | $4114^{\circ} 91$ $y 3$ <br> $63^{\circ} 27$ 3.6143598 <br> 4600 9.9516020 <br> 2056.10 3.6627578 <br> (a.) The Logarithm book has to be opened in four different places. <br> (b.) Two separate additions have to be made. <br> (c.) In taking out natura' numbers, proportional parts have to be resorted to, in order to find figures of second decimal place. <br> (d.) Besides the calculations, 48 more figures have to be written in than by Traverse Tables. |
| $26^{\circ} 29^{\prime}-9987$ links. |  column the Sin. and Cos. added together give the result. | A calculation similar to that given above is necessitated by Iogarithms. |

In conclusion, the Author would express a hope that these Tables-compiled in the first instance, as already indicated, for private use-will be found helpful by all engaged in active practice, whether as Surveyors or as Engineers, not only in these Colonies, but in every part of the world where Traverse Tables are employed. No pains have been spared to ensure accuracy-the Tables exhibiting results arrived at by two different methods of computation pursued independently by the Author and assistants; and the utmost care has been bestowed upon the work during its progress through the Press-the Proof-sheets having in every instance been corrected by the writer, notwithstanding the fact that some thousands of miles intervene between himself and the Publishers. Finally, before publication, as a last precaution, the Tables were recomputed a third time, and the whole work was subjected to a rigid and most careful revision, leaving it, as the Author thinks himself justified in believing, absolutely free from error.

R. L. GURDEN,<br>Kerang, Victoria.

TRAVERSE TABLES.

| 0 | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $0^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | $1^{\prime}$ | $2^{\prime}$ | $3{ }^{\prime}$ | $4^{\prime}$ | $5^{\prime}$ | $6^{\prime}$ | $7{ }^{\prime}$ | $8^{\prime}$ | $9^{\prime}$ | 0 | $1^{\prime}$ | $2^{\prime}$ | 3 | $4^{\prime} 1$ | $5^{\prime}$ | 6 | $7^{\prime}$ | $8{ }^{\prime}$ | $9^{\prime}$ |  |
|  | 0000 | 0000 | 0000 | 000 | 0000 | 0000 | 0000 | 0000 | 0000 | $1 \cdot 0000$ | 0000 | 0003 | 0006 | 0009 | 0012 | 0015 | 0017 | 0020 | 0023 | 0026 |  |
| 2 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 2.0000 | . 0000 | 0006 | 0012 | 0017 | 0023 | 0029 | 0035 | 0041 | 0047 | 0052 |  |
|  | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 3.0000 | 0000 | 0009 | 0017 | 0026 | 0035 | 0044 | 0052 | 0061 | 0070 | 0079 | 3 |
| 4 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 4.0000 | 0000 | 0012 | 0023 | 0035 | 0047 | 0058 | 0070 | 0081 | 0093 | 0105 | 4 |
| 5 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 000 | 0000 | 5.0000 | 0000 | 0015 | 0029 | 0044 | 0058 | 0073 | 0087 | 0102 | 0116 | 0131 | 5 |
| 6 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 6.0000 | 0000 | 0017 | 0035 | 0052 | 0070 | 0087 | 0105 | 0122 | 0140 | 015 |  |
| 7 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | $7 \cdot 0000$ | 0000 | 0020 | 0041 | 0061 | 0081 | 0102 | 0122 | 0143 | 0163 | 0183 |  |
| 8 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 8.0000 | . 0000 | 0023 | 0047 | 0070 | 0093 | 0116 | 0140 | 0163 | 0186 | 0209 |  |
|  | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | . 0000 | 0000 | 0026 | 0052 | 0079 | 0105 | 0131 | 0157 | 0183 | 0209 | 0236 |  |
| 10 | 0000 | 0000 | 000 | 0000 | 0000 | 00 | 000 | 0000 | 0000 | 10.0000 | 00 | 0029 | 0058 | 0087 | 0116 | 0145 | 0175 | 0204 | 0233 | 026 | 10 |
| 11 | 0000 | 0000 | 00 | 0000 | 0000 | 00 | 00 | 0000 | 0000 | 11.0000 | 0000 | 0032 | 0064 | 009 | 0128 | 0160 | 192 | 22 | 0256 | 0288 | 11 |
| 12 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 12.0000 | 0000 | 0035 | 0070 | 0105 | 0140 | 0175 | 0209 | 0244 | 0279 | 031 | 12 |
| 13 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 13.0000 | 0000 | 0038 | 0076 | 0113 | 0151 | 0189 | 0227 | 0265 | 0303 | 0340 | 13 |
| 14 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 000 | 0000 | 0000 | 14:0000 | 0000 | 0041 | 0081 | 0122 | 0163 | 0204 | 0244 | 0285 | 0326 | 0367 | 14 |
| 15 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | +000 | 14.9999 | 0000 | 0044 | 0087 | 0131 | 0175 | 0218 | 0262 | 0305 | 034 | 0393 | 15 |
| 16 | 0000 | 0000 | 0000 | 0000 | 000 | 00 | 00 | 0000 | +000 | 15 | 0000 | 00 | 0093 | 0140 | 0186 | 0233 | 0279 | 0326 | 03 | 0419 | 16 |
| 17 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | -000 | 16.9999 | 0000 | 0049 | 0099 | 0148 | 0198 | 0247 | 0297 | 0346 | 0396 | 0445 | 17 |
| 18 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | -000 | 17.999 | 0000 | 0052 | 0105 | 0157 | 0209 | 0262 | 0314 | 0367 | 0419 | 047 | 18 |
| 19 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 18.9999 | 0000 | 0055 | 0111 | 0166 | 0221 | 0276 | 0332 | 0387 | 0442 | 0497 | 19 |
| 20 | 0000 | D | 0000 | 0000 | 0000 | 00 | 00 | 1000 | 9999 | 19.9999 | 0000 | 0058 | 0116 | 0175 | 0233 | 0291 | 0349 | 0407 | 0465 | 0524 | 20 |
| 21 | 0000 | 00 | 00 | 0000 | 0000 | 0000 | 00 | 00 | 9999 | 20.9999 | 0000 | 0061 | 0122 | 018 | 0244 | 0305 | 0367 | 0428 | 04 | 0550 | 21 |
| 22 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 21.9999 | 0000 | 0064 | 0128 | 0192 | 0256 | 0320 | 0384 | 0448 | 0512 | 057 | 22 |
| 23 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | -000 | 9999 | 22.9999 | D000 | 0067 | 0134 | 0201 | 0268 | 0335 | 0401 | 0468 | 0535 | 0602 | 23 |
| 24 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | ,00 | 9999 | 9999 | 23.9999 | 0000 | 0070 | 0140 | 0209 | 0279 | 0349 | 0419 | 0489 | 0559 | 062 | 24 |
| 25 | 0000 | 00 | 000 | 0000 | 000 | 000 | 00 | 9999 | 9999 | 24.999 | 00 | 0073 | 0145 | 0218 | 0291 | 0364 | 0436 | 050 | 05 | 06 | 25 |
| 26 | 0000 | 00 | 0000 | 00 | 0000 | 0000 | - 10 | 9999 | 999 | 25 | 0000 | 0076 | 0151 | 022 | 0303 | 0378 | 0454 | 05 | 0605 | 0681 | 26 |
| 27 | 0000 | 0000 | 000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 26.999 | 0000 | 0079 | 0157 | 0236 | 0314 | 0393 | 0471 | 0550 | 0628 | 070 | 27 |
| 28 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | $27 \cdot 99$ | 0000 | 0081 | 0163 | 0244 | 0326 | 0407 | 0489 | 0570 | 0652 | 0733 | 28 |
| 29 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 28.9999 | 0000 | 0084 | 0169 | 0253 | 0337 | 0422 | 0506 | 0590 | 0675 | 0759 | 29 |
| 30 | 0000 | 0000 | 00 | 0000 | 0000 | 000 | -000 | 9999 | 9999 | 29.9999 | 000 | 0087 | 0175 | 0262 | 0349 | 0436 | 0524 | 0611 | 0698 | 078 | 30 |
| 31 | 0000 | 0000 | 000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 30.9999 | 0000 | 0090 | 0180 | 0271 | 036 | 0451 | 0541 | 0631 | 0721 | 0812 | 31 |
| 32 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | , 000 | 9999 | 9999 | 31.99 | 0000 | 0093 | 0186 | 0279 | 0372 | 0465 | 0558 | 0652 | 0745 | 0838 | 32 |
| 33 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 32.999 | 0000 | 0096 | 0192 | 0288 | 0384 | 0480 | 0576 | 0672 | 0768 | 086 | 33 |
| 34 | 0000 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 33.9999 | 0000 | 0099 | 0198 | 0297 | 0396 | 0494 | 0593 | 0692 | 0791 | 089 | 34 |
| 35 | 0000 | 0000 | 00 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 34.9999 | 0000 | 0102 | 0204 | 0305 | 0407 | 0509 | 0611 | 0713 | 0814 | 091 | 35 |
| 36 | 000 | 00 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 35' | 0000 | 0105 | 02 | 03 | 0419 | 4 | 06 | 0733 | 0838 | 0942 | 36 |
| 37 | 0000 | 0000 | 000 | 0000 | 0000 | - 000 | 9999 | 9999 | 9999 | 36.99 | 0000 | 0108 | 0215 | 0323 | 0431 | 0538 | 0646 | 0753 | 0861 | 0969 | 37 |
| 38 | 0000 | 0000 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 37.999 | 0000 | 0111 | 0221 | 0332 | 0442 | 0553 | 0663 | 0774 | 0884 | 09 | 38 |
| 39 | 0000 | 0000 | 0000 | 0000 | 0000 | +000 | 9999 | 9999 | 9999 | 38.9999 | 0000 | 0113 | 0227 | 0340 | 0454 | 0567 | 0681 | 0794 | 0908 | 102 | 39 |
| 40 | 0000 | 0000 | 0000 |  | 000 | 000 | 9999 | 9999 | 9999 | 39.9999 | 00 | 0116 | 0233 | 0349 | 0465 | 0582 | 0698 | 0814 | 0931 | 104 | 40 |
| 41 | 0000 | 0000 | 000 | 000 | 0000 | 1000 | 9999 | 9999 | 9999 | 40.999 | 0000 | 119 | 0239 | 0358 | 0477 | 0596 | 0716 | 0835 | 0954 | 07 | 41 |
| 42 | 0000 | 0000 | 000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 41.99 | 0000 | 0122 | 0244 | 0367 | 0489 | 0611 | 0733 | 0855 | 0977 | 110 | 42 |
| 43 | 0000 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 42.999 | 0000 | 0125 | 0250 | 0375 | 0500 | 0625 | 0750 | 0876 | 1001 | 12 | 43 |
| 44 | 0000 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 43.9999 | 0000 | 0128 | 0256 | 0384 | 0512 | 0640 | 0768 | 0896 | 1024 | 115 | 44 |
| 45 | 0000 | 0000 | 0000 | 0000 | 000 | 1000 | 9999 | 9999 | 9999 | 44'9998 | 0000 | 0131 | 0262 | 0393 | 0524 | 0654 | 0785 | 0916 | 1047 | 117 | 45 |
| 46 | 000 | 00 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9999 | 45 | 0000 | 0134 | 0268 | 04 | 0535 | 0669 | 0803 | 0937 | 70 | 1204 | 46 |
| 47 | 0000 | 0000 | 00 | 0000 | 1000 | 9999 | 9999 | 9999 | 9999 | 46.99 | 0000 | 0137 | 0273 | 0410 | 0547 | 0684 | 0820 | 0957 | 1094 | 123 | 47 |
| 48 | 0000 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9999 | 47.999 | 0000 | 0140 | 0279 | 0419 | 0559 | 0698 | 0838 | 0977 | 1117 | 125 | 48 |
| 49 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9999 | 48.9998 | 0000 | 0143 | 0285 | 0428 | 0570 | 0713 | 0855 | 0998 | 1140 | 128 | 49 |
| 50 | 00 | 0 | 00 | 0 | . 000 | 99 | 99 | 9999 | 9999 | 49.9998 | 0000 | 0145 | 0291 | 0436 | 0582 | 0727 | 0873 | 1018 | 164 | 1309 |  |
| 51 | 0000 | 00 | 0000 | 0000 | +000 | 9999 | 9999 | 9999 | 9999 | 50.999 | 0000 | 0148 | 0297 | 0445 | 0593 | 0742 | 0890\| | 1038 | 1187 | 1335 | 51 |
| 52 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9999 | 51.9998 | 0000 | 0151 | 0303 | 0454 | 0605 | 0756 | 0908 | 1059 | 12 | 136 | 52 |
| 53 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9999 | 52.9998 | 0000 | 0154 | 0308 | 0463 | 0617 | 0771 | 0925 | 1079 | 1233 | 138 | 53 |
| 54 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9999 | 53.99 | 0000 | 0157 | 0314 | 0471 | 0628 | 0785 | 0942 | 1100 | 1257 | 1414 | 54 |
| 55 | 0000 | 000 | 0000 | 0000 | 1000 | 9999 | 999 | 9999 | 9999 | 54.999 |  | 0160 | 0320 | 0480 | 0640 | 0800 | 0960 | 1120 | 1280 | 1440 | 55 |
| 56 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 99 | 9999 | 9998 | 55'999 | 00 | 0163 | 0326 | 0489 | 0652 | 08 | 0977 | 1140 | 1303 | 1466 | 56 |
| 57 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9998 | 56.9998 | 0000 | 0166 | 0332 | 0497 | 0663 | 0829 | 0995 | 116 | 1326 | 1492 | 57 |
| 58 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9998 | 57.9998 | -0000 | 0169 | 0337 | 0506 | 0675 | 0844 | 1012 | 118 | 1350 | 1518 | 58 |
| 59 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9998 | 58.999 | 0000 | 0172 | 0343 | 0515 | 0687 | 0858 | 1030 | 1201 | 1373 | 1545 | 59 |
| 60 | 0000 | 00 | 0 | O | 1000 | 999 | 1999 | 9999 | 9998 | 59.999 | 000 | 0175 | 0349 | 0524 | 069 | 0873 | 1047 | 1222 | 139 | 1571 | 60 |
| 61 | 0000 | 000 | 0000 | 0000 | 00 | 9999 | 9999 | 9999 | 9998 | 60.999 | 0000 | 0177 | 0355 | 0532 | 0710 | 0887 | 1065 | 1242 | 1420 | 163 | 61 |
| 62 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9998 | 61.9998 | 0000 | 0180 | 036 | 0541 | 0721 | 0902 | 1082 | 1262 | 1443 | 1623 | 62 |
| 63 | 0000 | 0000 | 0000 | 000 | 1000 | 9999 | 9999 | 9999 | 9998 | 62.9998 | 0000 | 0183 | 0367 | 0550 | 0733 | 0916 | 1100 | 1283 | 1466 | 1649 | 63 |
| 64 | 0000 | 0000 | 0000 | 0000 | +000 | 9999 | 9999 | 9999 | 9998 | 63.999 | 0000 | 0186 | 0372 | 0559 | 0745 | 0931 | 1117 | 1303 | 1489 | 1676 | 64 |
| 65 | 0000 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 64.9998 | 0000 | 0189 | 0378 | 0567 | 0756 | 0945 | 1134 | 1324 | 1513 | 1702 | 65 |
| 66 | 0000 | 0000 | 0000 | 000 | 000 | 9999 | 9999 | 9999 | 9998 | 65.999 | 0000 | 0192 | 0384 | 057 | 0768 | 0960 | 1152 | 134 | 1536 | 172 | 66 |
| 67 | 000 |  | - |  |  | 9999 | 9999 | 9999 | 9998 | 66.999 | 0000 | 0195 | 0390 | 0585 | 0780 | 0974 | 1169 | 1364 | 1559 | 1754 | 67 |
| 68 | 0000 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999. | 9999 | 9998 | 67.9998 | 0000 | 0198 | 0396 | 0593 | 0791 | 0989 | 1187 | 1385 | 1582 | 1780 | 68 |
| 69 | 0000 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 68.9998 | 000 | 0201 | 0401 | 0602 | 0803 | 1004 | 1204 | 1405 | 1606 | 1806 | 69 |
| 70 | 0000 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 69.9998 | 000 | 0204 | 0407 | 061 | 0815 | 1018 | 1222 | 142 | 162 | 1833 | 70 |
| 71 | 0000 | 0000 | 0 | 00 | 000 | 9999 | 9999 | 9999 | 9998 | 70.999 | 000 | 0207 | 0413 | 0620 | 0826 | 1033 | 1239 | 1446 | 1652 | 185 | 71 |
| 72 | 0000 | 0000 | 0000 | +000 | 9999 | 9999 | 9999 | 9998 | 9998 | 71.9998 | 0000 | 0209 | 0419 | 0628 | 0838 | 1047 | 1257 | 1466 | 1676 | 1885 | 72 |
| 73 | 0000 | 0000 | 0000 | . 00 | 9999 | 9999 | 9999 | 9998 | 9998 | 72.999 | D000 | 0212 | 0425 | 0637 | 0849 | 1062 | 1274 | 1486 | 169 | 917 | 73 |
| 74 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 9998 | 73.9997 | 0000 | 0215 | 0431 | 0646 | 0861 | 1076 | 1292 | 1507 | 1722 | 1937 | 74 |
| 75 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9998 | 98 | 74.9997 | 0000 | 0218 | 0436 | 0655 | 0873 | 1091 | 1309 | 1527 | 1745 | 1964 | 75 |
| 76 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 9998 | 75.9997 | 0000 | 0221 | 0442 | 0663 | 0884 | 1105 | 1326 | 1548 | 1769 | 砣 | 76 |
| 78 | 0000 | 000 | 000 | 1000 | 9999 | 9999 | 9999 | 9998 | 9998 | $76 \cdot 9997$ | 0000 | 0224 | 0448 | 0672 | 0896 | 1120 | 1344 | 1568 | 1792 | 2016 | 78 |
| 78 | 0000 | 0000 | 0000 | \$000 | 9999 | 9999 | 9999 | 9998 | 9998 | $77 \cdot 9997$ | 0000 | 0227 | 0454 | 0681 | 0908 | 1134 | 1361 | 158 | 1815 | 2042 | 78 |
| 79 | 0000 | 0000 | 000 | . 000 | 9999 | 9999 | 9999 | 9998 | 9998 | 78.9997 | 0000 | 0230 | 0460 | 0689 | 0919 | 1149 | 1379 | 1609 | 1838 | 2068 | 79 |
| 80 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 9998 | 79.9997 | 0000 | 0233 | 0465 | 0698 | 0931 | 1164 | 1396 | 162 | 186 | 209 | 80 |
| 81 | 0000 | 0000 | 000 | 1000 | 9999 | 9999 | 9999 | 9998 | 9998 | 80.9997 | 0000 | 0236 | 0471 | 0707 | 0943 | 1178 | 1414 | 1649 | 1885 | 2121 |  |
| 82 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 9998 | 81.9997 | 0000 | 0239 | 0477 | 0716 | 0954 | 1193 | 1431 | 1670 | 1908 | 2147 | 82 |
| 83 | 0000 | 0000 | 0000 | -000 | 析 | 9999 | 999 | 9988 | 9998 | 82.9997 | -0000 | 0241 | 0483 | 0724 | 0966 | 1207 | 1449 | 1690 | 193 | 2173 | 83 |
| 84 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 9998 | 83.9997 | 0000 | 0244 | 0489 | 0733 | 0977 | 1222 | 1466 | 1710 | 1955 | 2199 | 84 |
| 85 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9998 | 98 | 84:9997 | . 0000 | 0247 | 49 | 10742 | 0989 | 1236 | 1484 | 1731 | 197 | 2225 | 35 |
| 86 | 0000 | 0000 | 0000 | +000 | 9999 | 9999 | 9999 | 9998 | 9998 | 85.999 | . 0000 | 0250 | 0500 | 0751 | 1001 | 1251 | 150 | 175 | 200 | 22 | 86 |
| 8 | 0000 | 0000 | 000 | +000 | 9999 | 9999 | 9999 | 9998 | 9998 | 86.9997 | -0000 | 0253 | 0506 | 0759 | 1012 | 1265 | 1518 | 1771 | 2025 | 2278 | 87 |
| 88 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9998 | 9998 | $87 \cdot 9997$ | -0000 | 0256 | 0512 | 0768 | 1024 | 1280 | 1536 | 1792 | 2048 | 2304 | 88 |
| 89 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 999 | 9998 | 9998 | 88.9997 | 0000 | 0259 | 0518 | 0777 | 1036 | 1294 | 1553 | 1812 | 2071 | 2330 | 89 |
| 90 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9998 | 9998 | 89.9997 | 0000 | 0262 | 0524 | 0785 | 1047 | 1309 | 1571 | 1833 | 2094 | 2356 | 90 |
| 91 | 0000 | 0000 | 0000 | P000 | 9999 | 9999 | 9999 | 9998 | 9998 | 90.9997 | 0000 | 0265 | 0529 | 0794 | 1059 | 1324 | 1588 | 1853 | 2118 | 2382 | 91 |
| 92 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 9998 | 91.9997 | -0000 | 0268 | 0535 | 0803 | 1071 | 1338 | 1606 | 1873 | 2141 | 2409 | 92 |
| 93 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 9998 | 92.9997 | -0000 | 0271 | 0541 | 0812 | 1082 | 1353 | 1623 | 1894 | 2164 | 2435 | 93 |
| 94 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 9998 | 93.9997 | 0000 | 0273 | 0547 | 0820 | 1094 | 1367 | 164 | 1914 | 2187 | 246 | 94 |
| 95 | 0000 | 0000 | 0000 | -000 | 99 | 99 | 9999 | 9998 | 19998 | 94.9997 | 000 | 27 | 0553 | 0829 | 1105 | 1382 | 165 | 1934 | 2211 | 2487 | 5 |
| 96 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 9998 | 95.9997 | -0000 | 0279 | 0559 | 0838 | 1117 | 1396 | 1675 | 1955 | 2234 | 2513 | 96 |
| 97 | 0000 | 0000 | 000 | . | 9999 | 9999 | 9999 | 9998 | 9998 | 96.9997 | -0000 | 0282 | 0564 | 0847 | 1129 | 1411 | 1693 | 1975 | 2257 | 2539 | 97 |
| 98 | 0000 | 0000 | 0000 | -000 | 9999 | 9999 | 9999 | 9998 | 9998 | 97.9997 | -0000 | 0285 | 0570 | 0855 | 1140 | 1425 | 1710 | 1995 | 2281 | 2566 | 98 |
|  | 0000 | 0000 | 0000 | -000 | 9999 | 999 |  | 9998 | 9988 | 98.9997 | 0000 | 0288 | 0576 | 0864 | 1152 | 1440 | 1728 | 2016 | 2304 | 2592 | 99 |
| 100 | 0000 | 0000 | 0000 | 1000 | 9999 | 9999 | 9999 | 9998 | 9998 | 99.9997 | 0000 | 0291 | 0582 | 0873 | 1164 | 1454 | 1745 | 2036 | 2327 | 2618 | 100 |
|  | $60^{\prime}$ | $59^{\prime}$ | $58^{\prime}$ | $57^{\prime}$ | $56^{\prime}$ | $55^{\prime}$ | $54^{\prime}$ | $53^{\prime}$ | 52 | $51^{\prime}$ | 60 | 59 | $58^{\prime}$ | $57^{\prime}$ | 56 | $55^{\prime}$ | $54^{\prime}$ | 53' | 52' | $\mathrm{I}^{51}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Cos | NE |  |  |  |  | $89^{\circ}$ |

TRAVERSE TABLES．

| $0^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | SINE． |  |  |  |  |  |  |  |  |  | $0^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11^{\prime}$ | $12{ }^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | 15 | 16 | $17^{\prime}$ | $18{ }^{\prime}$ | $19{ }^{\prime}$ | $10^{\prime}$ | 11 | 12 | $1: 3$ | $14^{\prime}$ | $15^{\prime}$ |  | 17 |  |  |  |
|  | 0000 | 0000 | 0000 | 0000 | 0000 | 000 | 0000 | 000 | 000 | 1.00 | 002 | 0032 | 003 | 0038 | 0041 | 0044 | 0047 | 0049 | 0052 | 055 |  |
|  | 0000 | 000 | 00 | 0000 | 00 | 00 | 00 | 00 | 000 | 2. | 058 | 006 | 007 | 0076 | 0081 | 0087 | 0093 | 0099 | 0105 | 0111 |  |
| 3 | 0000 | 0000 | 000 | O00 | 0000 | 0000 | 00 | 0000 | 0000 | 3.00 | 0087 | 0096 | 0105 | 0113 | 0122 | 0131 | 0140 | 0148 | 0157 | 01 |  |
| 4 | 0000 | 0000 | 0000 | 0000 | 0000 | O0， | 硅 | －000 | 9999 | 3.99 | 0116 | 0128 | 01 | O | 01 | 0175 | 0186 | 0198 | 0209 | 022 |  |
| 5 | 0000 |  |  |  |  |  |  |  |  |  |  | 0160 | 01 | ， | 0204 | 0218 | 023 | 02 | 0262 | 027 |  |
| 6 | 0000 | 0000 | 0000 | 0000 | －000 | 9999 | 9999 | 9999 | 9999 | 5.9999 | 0175 | 0192 | 0209 | 0227 | 0244 | 02 | 027 | 02 t | 0314 | 0332 |  |
|  | 000 | 0000 | ． 000 |  | 保 | 999 | 999 | 99 |  | 6 | 1 | 02 | 02 | 02 | 028 | 0305 | 03 | 034 | O3 |  |  |
| 8 | 000 | 00 |  |  |  |  |  | 999 |  | －99 | 233 | 0256 | 027 | 0303 | 0326 | 0349 | 037 | 0396 | 0419 | 0442 |  |
|  | 0000 | －000 |  |  |  | 999 | 9999 | 999 | 9930 |  | 262 | 0288 | 0314 | 0340 | 0367 | 039 | 04 | 0445 | 047 | 049 |  |
| 10 | ＋000 | 998 | 999 | 99 | 9999 | 9999 | 999 | 999 | 999 | 9999 | 29 | 0320 | 0349 | 0378 | 0407 | 0436 | 046 | 0495 | 0524 | 0553 | 0 |
| 11 | －000 | 9999 |  |  |  |  |  |  |  | 10 |  | 0352 | 0384 |  | 0448 | 0480 | 0512 | 0544 | 0576 |  | 1 |
| 12 | 999 |  |  |  |  |  |  |  |  |  |  | 0384 | 041 | 04 | 04 | 052 | 55 | 0593 | 0628 | 66 | 12 |
| 13 | 9999 | 999 | 99 | 99 | 9999 | 99 | 99 | 9998 | 999 | 12.99 | 0378 | 0416 | 0454 | 049 | 05 | 0567 | 0605 | 0643 | 06 | 071 | 13 |
| 14 | 99 |  |  |  |  | 999 | 9998 | 9998 | 9998 | 13.9 | C407 | 0448 | 0489 | 0529 | 0570 | 0611 | 065 | 0692 | 0733 | 077 | 14 |
| 15 | 9999 |  |  |  |  | 9999 | 9998 | 9998 | 9998 | 14 | 0436 | 80 | 0524 | 0567 | 06 | 0654 | 069 | 074 | 0785 | 082 | 15 |
| 16 | 999 | 99 | 9999 | 9999 | 9999 | 9998 | 9998 | 9998 | 9998 | 15.9998 | 0465 | 0512 | 0559 | 0605 | 0652 | 069 | 0745 | 079 | 0838 | 0884 | 6 |
| 17 | 9999 | 9999 | 999 | 9999 | 5999 | 998 |  | 9998 |  | 16.99 |  | 054 | 05 |  | 0692 | 0742 | 079 | 08 |  | 0940 |  |
| 18 | 99 | 99 |  |  |  | 99 | 9998 |  | 99 | $17 \cdot 99$ | 524 | 0576 | 06 | 0681 | 0733 | 0785 | 838 | 089 |  | 0995 | 18 |
| 19 | 9999 | 999 | 999 | 9999 |  | 9998 | 998 | 9998 | 99 | 18 ．9 | 553 | 0608 | 066 | 07 | 0774 | 0829 | 088 | 0940 | 0995 | 1050 | 19 |
| 20 | 999 | 9999 | 9999 | 9999 | 9998 | 98 | 98 | 9998 | 9997 | 19.9997 | 0582 | 0640 | 069 | 0756 | 08 | 0873 | 093 | 0989 | 1047 | 1105 | 20 |
| 21 | 99 |  |  |  |  |  |  |  |  |  |  | 0672 | 0733 | 0794 |  | 0916 | 0977 | 1038 | 1100 |  | 21 |
| 22 | 99 |  |  |  |  |  |  |  |  | 21.99 | 640 | 070 | 076 | 0832 | 08 | 0960 | 1024 | 108 | 1152 | 12 | 22 |
| 23 | 99 | 999 | 999 | 9998 |  | 99 | 9998 | 999 | 99 | 22.9 | 669 | 0736 | 0803 | 08 | 09 | 1004 | 1070 | 1137 | 12 | 127 | 23 |
| 24 | 999 | 9999 |  |  |  | 9 |  |  | 99 | 23 ． |  | 0768 | 0838 | 0908 | 0977 | 1047 | 1117 | 118 | 1257 | 132 | 24 |
| 25 | 999 | 9999 | 999 | 99 | 99 | 9998 | 9997 | 99 | 9997 | 24 | 0727 | 080 | 087 | 0945 | 101 | 109 | 116 | 123 | 1309 | 13 | 25 |
| 26 | 999 | 99 | 9998 | 9998 | 9998 | 9998 | 9997 | 9997 | 9996 | 25.999 | 0756 | 0832 | 0908 | 0983 | 1059 | 113 | 1210 | 1286 | 1361 | 1437 | 26 |
| 27 | 99 | 99 |  |  |  |  | 9997 |  | 9996 |  |  | 08 | 0942 |  |  | 117 | 12 | 1335 |  |  | 27 |
| 28 | 999 | 995 |  |  |  |  |  |  |  |  | 14 | 089 | 09 |  | 1140 | 122 | 130 | 138 | 146 | 154 | 28 |
| 29 | 999 | 99 |  |  |  | 9997 | 9997 |  |  | 28. |  |  | 1012 |  |  | 1265 | 135 | 143 |  |  | 29 |
| 30 | 999 | 9998 | 9998 | 9998 | 9998 | 999 | 999 | 9996 | 9996 | 29.9995 | － | 0960 | 1047 | 1134 | 1222 | 30 | 139 | 1484 | 1571 | 165 | 30 |
| 31 | 99 |  |  |  |  |  |  |  |  |  |  | 0992 | 1082 |  |  | 135 | 1443 | 1533 |  |  | 31 |
| 32 | 99 |  |  |  |  |  |  |  |  | 31.9 | D931 | 102 | 11 | 12 | 13 | 139 | 148 | 15 | 1676 |  | 32 |
| 33 | 99 | 99 | 999 | 999 | 99 | 9997 | 9996 |  |  | 32.99 |  | 105 | 115 | 1248 | 13 | 1440 | 153 | 163 | 1728 | 182 | 33 |
| 34 | 99 | 9998 | 9 |  | 9 | 9997 | 9 |  |  |  |  | 108 |  | 128 |  | 148 | 158 | 168 | 1780 | 187 | 34 |
| 35 | 999 | 9998 | 9998 | 999 | 9997 | 9997 | 9996 | 9996 | 99 | 34 | 1018 | 112 | 12 | 132 | 1425 | 152 | 16 | 173 | 188 | 193 | 35 |
| 36 | 99 | 99 | 9998 | 9997 | 9997 | 9997 | 9996 | 9996 | 9995 | 35 ＇999 | 1047 | 1152 | 125 | 1361 | 1466 | 1571 | 1676 | 1780 | 1885 | 1990 | 36 |
| 37 | 99 |  |  |  |  |  |  |  |  |  |  | 118 | 1292 |  |  | 1614 | 172 | 1830 |  | 04 | 37 |
| 38 | 998 |  |  |  |  |  |  |  | 9995 | 37. | 110 | 121 | 132 | 143 | 15 | 1658 | 176 | 18 | 19 | 21 | 38 |
| 39 | 998 |  | 9998 |  |  |  |  |  |  | 38. |  | 124 |  |  |  | 1702 | 181 | 192 | 20 |  | 39 |
| 40 | 9998 | 98 | 9998 | 9997 | 9907 | 9996 | 9996 | 9995 | 9995 | 39.99 | 1164 | 1280 | 1396 | 1513 | 1629 | 1745 | 186 | 197 | 2094 | 221 |  |
| 41 | 99 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 178 |  |  |  |  | 41 |
| 42 | 998 |  | 99 | 99 | 99 |  |  |  |  | 41.9 |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 999 | 99 | 99 |  |  | 9996 |  |  | 9994 | 42.99 | 1251 | 1376 | 1501 | 1626 | 175 | 187 | 20 | 2126 |  | 237 | 43 |
| 44 | 999 | 998 | 997 |  |  | 9996 |  |  |  |  |  | 140 | 15 |  | 17 | 192 | 20 | 21 | 4 | 243 | 44 |
| 45 | 9998 | 9998 | 999 | 999 |  |  |  |  |  |  |  | 144 |  |  |  | 196 |  | 22 |  |  | 45 |
| 46 | 99 | 9998 | 9997 | 9997 | 9996 |  | 9995 |  |  | 45.9993 |  | 1472 | 1606 |  | 1873 | 2007 |  |  |  |  | 46 |
| 47 | 99 |  |  |  |  | 9996 |  |  | 9994 | 46.99 |  | 150 | 164 |  | 1914 | 2051 | 2187 | 324 |  |  |  |
| 48 | 999 | 99 | 999 | 99 | 99 |  |  |  |  | 47 |  | 15 | 167 |  |  | 20 | 2234 |  |  |  | 48 |
| 49 |  |  |  |  |  |  |  |  |  |  |  | 156 | 171 | 185 | 199 | 213 | 228 | 24 |  | 270 | 49 |
| 50 | 998 | 9997 | 9997 | 9996 | 9996 | 9995 | 9995 | 9994 | 9993 | 49．999 | 1454 | 160 | 1745 | 1891 | 2036 | 2182 | 232 | 2473 | 2618 | 276 | 50 |
| 51 | 99 |  |  |  |  |  |  |  |  |  |  |  |  |  | 2077 | 222 |  | 25 |  |  |  |
| 52 | 99 |  |  |  |  |  |  |  |  |  |  |  |  |  | 21 |  |  |  |  |  |  |
| 53 | 99 | 99 | 9997 |  | 99 | 9995 |  |  | 9993 | 52.999 | 1542 | 169 | 18 | 2004 | 2158 | 2313 |  |  |  |  |  |
| 54 | 999 | 999 | 999 | 99 | 99 | 99 |  |  | 99 |  | T5 | 172 | 18 | 20 |  | 2356 | 25 | 26 | 2827 | 298 |  |
| 55 | 9998 | 9997 | 9997 |  | 99 | 9995 | 99 |  | 09 | 54 | 1600 | 1760 | 192 | 208 | 2240 | 240 | 25 | 272 | 2880 | 040 | 5 |
| 56 | 99 | 9997 | 9997 |  |  | 9995 |  |  |  |  |  | 179 |  |  |  |  |  |  |  |  | 56 |
| 57 | 99 | 9997 | 999 | 9996 |  | 9995 |  |  |  | 56．99 | 1658 | 1824 |  |  |  | 2487 | 2653 | 2819 |  |  |  |
| 58 | 99 | 99 |  |  |  | 998 |  |  |  | 57 |  | 18 |  |  |  |  |  |  |  |  |  |
| 59 | 999 |  |  |  |  | 9994 |  |  |  | 58 |  | 18 |  |  |  |  |  |  |  |  |  |
| 60 | 999 | 9997 | 9996 | 999 | 9995 | 94 | 9994 | 9993 |  | 59.999 | 1745 | 192 | 209 | 22 | 44 | 2618 | 2793 | 2967 | 3142 | 331 |  |
| 61 |  |  |  |  |  |  |  |  |  |  | ． 1774 | 195 |  |  |  | 2662 |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  | 1984 |  |  |  |  |  |  |  |  |  |
| 63 | 99 | 9997 |  |  |  |  |  |  |  |  |  | 2016 |  |  |  | 2749 |  | 3115 |  |  |  |
| 64 | 99 | 9997 |  |  |  |  |  |  | 999 |  | 186 |  |  |  |  | 2793 |  | 31 | 33 | 353 |  |
| 65 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3025 | 3214 | 3403 | 359 |  |
| 66 | 99 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 999 | 999 |  |  |  |  |  |  |  | 66 | 19 | 214 | 233 | 25 | 27 | 292 | 31 | 331 | 35 | 370 |  |
| 68 | 9997 | 997 |  |  |  |  |  |  |  |  | 197 | 2176 | 237 |  | 2769 | 296 | 31 | 3363 | 356 | 375 |  |
| 69 | 999 |  |  |  | 9994 | 仡 | 9993 |  |  |  |  | 2208 | 240 |  | 2810 | 3011 | 3211 |  | 3613 |  |  |
| 70 | 999 | 9996 | 9996 | 999 | 999 | 9993 | 9992 | 99 | 9990 | 69.9988 | 203 | 224 | 24 | 2647 | 285 | 305 | 325 | 346 | 366 | 386 |  |
| 71 | 99 | 9996 |  |  | 9994 |  |  |  | 9990 | 70 | 206 | 2272 | 24 | 2685 | 289 | 析 | 33 | 351 | 371 | 39 |  |
| 72 |  |  |  |  |  |  |  |  |  |  | 209 | 2304 | 2513 |  | 2932 | 14 |  |  |  |  |  |
| 73 | 999 | 9996 | 99 | 9995 | 99 | 99 | 99 | 999 | 99 | 72 | 2123 | 2336 | 2548 | 27 | 2973 | 318 | 339 | 3610 | 382 | 403 |  |
| 74 | 999 | 9996 |  |  |  | 9993 |  | 9991 | 990 |  | －2153 | 2368 | 2583 | 2798 | 3014 | 3229 | 34 | 36 | 387 | 409 |  |
| 75 | 9997 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 76 | 9997 |  |  |  |  |  |  |  |  |  | 2211 | 243 | 2653 | 287 |  | 析 |  |  |  |  |  |
| 77 | 9997 | 99 | 99 | 99 | 9994 | 9993 |  | 999 | 9989 | 76.99 | 2240 | 2464 | 2688 | 2912 | 3136 | 336 | 358 | 380 | 403 | 425 |  |
| 78 | 9997 |  |  |  |  |  |  | 9990 | 9 |  | 2260 | 2496 | 2723 | 295 | 176 | 3403 | 3630 | 3857 | 408 | 431 |  |
| 79 | 9997 | 9996 | 99 | 9994 | 93 | 9992 | 9991 | 9990 | 9989 | 78 | 2298 | 2528 | 2758 | 2987 | 3217 | 3447 | 367 | 3907 | 4136 |  |  |
| 80 | 9997 | 99 | 999 | 9994 | 9993 | 9992 | 9991 | 9990 | 9989 | 79.9988 | 2327 | 2560 | 27 | 302 | 32 | 349 | 372 | 3956 | 418 | 442 |  |
| 81 | 999 |  |  |  |  |  |  |  | 9989 | 998 | ． 2356 | 202 | 28 | 退 |  | 3534 | 3770 | 4006 | 424 | 44 |  |
| 82 | 999 | 9996 | 9995 |  |  | 9992 |  |  | 9 | － | 885 | 2624 | 28 | 310 | 3339 | 3578 | 3816 | 405 | 429 | － |  |
| 83 | 9997 | 99 | 999 | 999 | 9993 | 999 | 999 | 999 | 9989 | 82.998 | 2414 | 2656 | 2897 | 3139 | 3380 | 3522 | 3863 | 4104 | 4346 | 458 | 83 |
|  | 9996 | 9996 | 9935 |  |  | 992 | 9991 |  | 9988 | $83 \cdot 998$ | 4 | 268 | 293 | 317 | 3421 | 366 | 391 | 415 | 43 | 46 | 84 |
| 85 | 9996 | 9996 | 9995 |  | 993 | 999 | 999 |  | 9988 | 84.998 | 473 | 720 | 2067 | ， |  | 3709 | 析 | drs | 4 | 4643 |  |
|  | 9996 | 999 | 9995 | 9994 | 93 | 9992 | 999 | 9990 | 9988 | 85.99 | 250 | 2752 | 3002 | 328 | 3502 | 375 | 4003 | 仡 | ， 5 |  |  |
| 87 | 9996 | 9996 |  |  | 9993 | 9992 | 9991 | 89 | 9988 | 86.998 | 253 | 2784 | 3037 | 32 | 3543 | 379 | 404 | 43 | 45 | 48 | 87 |
| 88 | 999 | 9996 | 999 | 99 | 9993 | 9992 | 9990 |  | 9988 | 87．998 | 2560 | 2816 | 3072 | 3328 | 3584 | 384 | 1096 | 4352 | 460 | 析 |  |
| 89 | 9996 | 9995 |  |  | 93 | 9992 | 9990 | 9989 | 9988 | 88.9986 | 2589 | 2848 | 3107 | 3366 | 3624 | 388 | 414 | 440 | 466 | 491 |  |
| 90 | 9996 | 9995 |  | 9994 | 9993 | 9991 | 9990 | 988 | 9988 | 89.9986 | 2618 | 2880 | 314 | 340 | 3665 | 392 | 41 | 44 | 47 | 497 | 90 |
| 91 | 9996 | 9995 | 9994 |  | 咗 | 9991 | 9990 |  | 88 |  |  | 2912 | 3177 |  |  | 397 | 423 | 450 |  |  |  |
| 92 | 9996 | 9995 | 9994 | 9993 | 9992 | 999 | 9990 | 9989 | 9987 | 91.998 | 2676 | 2944 | 3211 | 3479 | 3747 | 4014 | 428 | 45 | 481 | 508 |  |
| 93 | 9996 | 9995 | 994 | 3 | 992 | 9991 | 9990 | 9989 | 9987 | 92．998 | 2705 | 2976 | 3246 | 3517 | 3787 | 4058 | 4328 | 45 | 4869 | 514 |  |
| 94 | 9996 | 9995 | 9994 | 9993 | 9992 | 999 | 99 | 9989 | 9987 | 93.9986 | 2734 | 3008 | 3281 | 355 | 3828 | 410 | 437 | 4648 | 492 | 519 | 94 |
| 95 | 9996 | 9995 | 9994 |  | 9992 | 9991 | 9990 | 9988 | 9987 | 94.9985 | 2763 | 304 | 3316 | 359 | 3869 | 414 | 442 | 46 |  | 525 | 95 |
| 96 | 9996 | 9995 |  |  |  | 9991 | 9990 | 9988 | 87 | 95.998 | 2793 | 3072 | 3351 | 36 | 3910 | 4189 | 4468 | 4747 | 5027 | 5306 |  |
| 97 | 999 | 999 | 99 | 9 | 9992 | 9991 | 9990 | 9988 | 9987 | 96．998 | 2822 | 3104 | 3386 | 3668 | 3950 | 4232 | 4515 | 479 | 5079 | 536 |  |
|  | 9996 | 9995 | 9994 | 99 | 99 | 9991 | 9989 | 9988 | 9987 | 97.9985 | 2851 | 3136 | 3421 | 370 | 3991 | 4276 | 4561 | 4846 | 5131 | 541 | 98 |
|  | 9996 | 995 | 994 |  |  | 999 | 9989 | 9988 | 9986 | 98．9985 | 2880 | 3168 | 3456 | 3744 | 4032 | 4320 | 4608 | 489 | 5184 | 5472 |  |
| 100 | 9996 | 9995 | 9994 | 9993 | 9992 | 9991 | 9989 | 9988 | 9986 | 99＇998 | 2909 | 3200 | 3491 | 3782 | 4072 | 4363 | 4654 | 4945 | 5236 | 5527 |  |
|  | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | 46 | $45^{\prime}$ | $44^{\prime}$ | $43^{\prime}$ | $42^{\prime}$ | $41^{\prime}$ |  | $4{ }^{\prime}$ | $4{ }^{\prime}$ | 47 | $46^{\circ}$ | $45^{\prime}$ | $47^{\prime \prime}$ |  |  | $41^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | SINE |  |  |  |  |  |

TRAVERSE TABLES．

| $0^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $0^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | ， | 2 | 23 | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 | $28^{\prime}$ | 29 | $20^{\prime}$ | 21 | $22^{\prime}$ | $23^{\prime}$ | 24 | $25^{\prime}$ | 26 | $27^{\prime}$ | $28^{\prime}$ |  |  |
|  | 000 | 0000 | 000 | 000 | 0000 | 0000 | 00 | 000 | 00 | 1.0 | 005 | 00 | 00 | 0067 | 0070 | 0073 | 0076 | 0079 | 0081 | 0084 |  |
|  | 000 | 000 | 000 | 0000 | 1000 | 999 | 999 | 9999 | 999 |  | 116 | 0122 | 0128 | 0134 | 0140 | 0145 | 0151 | 0157 | 63 | 0169 |  |
|  | 9999 | 9999 | 9999 | 9999 | 9999 | 999 | 9999 | 9999 | 999 |  | 17 | 0183 | 0192 | 0201 | 0209 | 0218 | 0227 | 0236 | 0244 | 025 |  |
|  | 9999 | 9999 | 9999 | 99 | 9999 | 9999 | 999 | 9999 | 99 | 3.9 | 0233 | 0244 | 02 | 0268 | 0279 | 0291 | 0303 | 0314 | 0326 | 033 |  |
|  | 999 | 9999 | 9999 | 999 | 999 | 9999 | 999 | 9998 | 9998 | 4.9998 | 0291 | 0305 | 0320 | 0335 | 0349 | 0364 | 037 | 0393 | 407 | 042 |  |
|  | 999 | 95 | 9999 | 9999 | 9999 | 9998 | 9998 | 9998 | 9998 | 5.9998 | 0349 | 0367 | 0384 | 0401 | 0415 | 0436 | 0454 | － | 0489 | 0506 |  |
|  | 999 | 9999 | 9999 |  | 999 | 99 |  |  |  |  | 40 | 042 | 04 | 04 | 0489 | 050 | 05 | 0550 | 70 | 0590 |  |
|  | 999 | 999 | 9998 | 999 | 999 | 998 | 9998 | 9998 | 999 | 7.9 | 465 | 04 | 0512 | 05 | 0559 | 0582 | 06 | 062 | 0652 | 0675 |  |
|  | 999 | 999 | 9998 |  | 9998 | 999 |  | 999 | 999 |  | 524 | 05 | 05 | 0602 | 0628 | 0654 | 0681 | 0707 | 0733 | 0759 |  |
| 10 | 9998 | 980 | 9998 | 9998 | 9998 | 97 | 97 | 9997 | 9997 | 9．99 | 582 | 061 | 0640 | 0669 | 0698 | 0727 | 0756 | 0785 | 0814 | 0844 | 0 |
| 11 | 999 | 099 |  | 099 | 099 | 9997 | 9997 | 9997 | 9996 | 10.999 | 6 | 067 |  |  | 0768 | 0800 | 0832 |  |  |  | 1 |
| 12 | 999 | 999 | 9998 | 999 | 99 | 99 | 9997 | 9996 | 998 |  | 698 | 07 | 07 | 08 | －8 | 0873 | 0908 | 0942 | 0977 | 1012 |  |
| 13 | 999 | 99 | 99 | 9997 | 9997 | 9997 | 99 | 9996 | 999 | 12.9 | 75 | 079 | 0832 | 087 | 0908 | 0945 | 09 | 1021 | 1059 | 109 | 13 |
| 14 | 999 | 99 | 999 | 9997 | 9997 | 999 | 99 | 9996 | 999 | 13.99 | 0814 | 085 | 089 | 09 | 0977 | 1018 | 10 | 1100 | 40 | 118 | 14 |
| 15 | 999 | 99 | 9997 | 9997 | 9996 | 9996 | 9996 | 995 | 95 | 14.9 | 0873 | 0916 | 0960 | 1004 | 1047 | 109 | 113 | 117 | 122 | 126 | 15 |
| 16 | 999 | 99 | 99 | 99 | 9996 | 9996 | 9995 | 9995 | 9995 | 15 | 093 | 0977 | 1024 | 10 | 1117 | 1164 | 12 | 1257 | 03 | 1350 | 16 |
| 17 | 9997 | 99 | 99 | 9و | 9996 |  |  |  |  | 16.99 |  | 103 |  | 113 | 11 | 1236 | 128 |  |  |  | 17 |
| 18 | 9997 | 9997 | 9996 | 9996 | 99 | 999 |  | 9994 | 9994 |  | 04 | 1100 | 1152 | 12 | 1257 | 130 | 1361 | 1414 | 1466 | 151 | 18 |
| 19 | 999 | 9996 | 9996 | 99 | 99 | 999 |  | 星 | 9994 | 18 | 10 | 116 | 1216 | 1271 | 132 | 138 | 143 | 14 | 1548 | 160 | 19 |
| 20 | 997 |  |  |  | 9995 |  |  |  | 9993 | 19.9993 | 1164 | 1222 | 1280 | 1338 | 1396 | 145 | 15 | 157 | 1629 | 1687 | 20 |
| 21 | 99 | 9996 |  | 9995 |  |  |  |  |  | 20．999 | 22 | 128 |  |  |  | 1527 |  |  |  |  | 21 |
| 22 | 999 | 999 | 99 |  | 99 | 99 |  |  | 9993 | 21.99 | 12 | 13 | 14 | 14 | 1536 | 1600 | 166 |  | 1792 | 185 | 22 |
| 23 |  | 999 |  | 99 | 99 | 9994 | 9993 | 9993 |  | 22.99 | 13 | 140 | 1472 | 15 | 1606 | 1673 | 173 | 18 | 1873 | 194 | 23 |
| 24 | 99 | 995 |  | 9995 | 99 | 99 | 9993 |  | 9992 | 23.99 | 396 | 14 |  |  | 1676 | 1745 | 18 | 1885 | 1955 | 202 | 24 |
| 25 | 99 | 999 | 999 | 9994 | 9994 | 999 | 9993 | 92 | 992 | 24．99 | 1454 | 152 | 160 | 167 | 1745 | 1818 | 189 | 196 | 2036 | 2109 | 25 |
| 26 | 99 | 99 | 999 | 999 | 999 | 9993 | 9993 | 9992 | 9991 | 25 | 1513 | 1588 | 16 | 174 | 18 | 189 | 196 | 2042 | 2118 | 2193 | 26 |
| 27 | 99 | 99 |  | 9994 | 9993 | 9993 |  |  | 9991 | 26.99 | 57 | 164 | 17 | 18 | 18 | 19 | 20 |  |  |  | 27 |
| 28 | 999 | 999 | 99 | 99 | 99 | 9993 | 9992 |  | 9991 | 27 | ． 162 | 171 | 179 |  | 19 | 203 | 21 |  |  | 236 | 28 |
| 29 | 99 | 99 | 9994 | 99 | 9993 | 9992 |  |  | 9990 | 28.99 | 168 | 177 | 1856 | 19 | 2025 | 210 | 219 | 227 | 2362 |  | 29 |
| 30 | 999 | 9994 |  | 9993 | 9 | 9992 |  | 9991 | 90 | 29.9988 | 1745 | 1833 | 1920 | 2007 | 2094 | 2182 | 226 | 235 | 2443 | 253 | 30 |
| 31 | 99 | 9994 |  |  |  |  |  |  |  | 30.998 | 1803 | 894 | 1984 |  |  | 2254 |  |  |  |  | 31 |
| 32 | 999 | 999 | 99 | 9993 | 9992 | 9992 | 99 |  |  | 31 | 186 | 195 | 2048 | 214 |  | 232 | 2420 | 2513 | 2606 | 26 | 32 |
| 33 | 999 | 998 | 99 | 9993 | 9992 | 9991 | 99 |  | 9989 | 32 | 192 | 201 | 21 |  | 2304 | 240 | 24 | 25 |  |  | 33 |
| 34 | 999 | 999 | 99 | 9992 |  | 999 | 99 |  |  |  | 97 | 207 | 2176 | 22 | 23 | 247 | 257 | 2670 | 27 |  | 34 |
| 35 | 9994 | 999 | 9993 | 992 | 99 | 9991 | 998 | 9989 | 9988 | 34. | 2036 | 213 | 22 | 23 | 24 | 254 | 26 | 27 | 28 | 2952 | 35 |
| 36 | 9994 | 9993 | 9993 | 9992 | 9991 | 9990 | 9990 | 9989 | 9988 | 35－998 | 2094 | 2199 | 2304 | 2409 | 2513 | 261 | 2723 | 2827 | 2932 | 3037 | 36 |
| 37 |  |  | 99 |  | 9991 |  |  |  | 9988 | $36 \cdot 99$ | 15 | 2260 | 2368 |  |  | 269 |  |  | 3014 | 12 | 37 |
| 38 | 99 | 99 | 99 | 99 | 999 | 9990 | 99 | 9988 |  | 37 | 21 | 23 | 2432 | 2542 | 26 | 2763 | 287 | 29 | 3095 | 320 | 38 |
| 39 | 99 |  | 99 | 99 | 9 |  |  |  | 9987 |  | 26 | 238 | 24 |  | 27 | 283 | 295 | 306 | 3176 | 329 | 39 |
| 40 | 999 | 9 | 9992 | 999 | 9990 |  |  | 9988 | 9987 | 39 99 | 2327 | 2443 | 2560 | 2676 | 2793 | 2909 | 30 | 3142 | 3258 | 337 | 40 |
| 41 | 999 | 99 |  |  |  |  |  |  |  |  | 238 |  |  |  |  | 2982 | 3101 |  |  |  | 41 |
| 42 | 99 | 99 |  |  |  |  |  |  |  |  | 244 | 25 |  |  |  |  |  |  |  |  | 42 |
| 43 | 99 | 99 | 99 | 9990 | 9990 | 9989 | 9988 | 9987 | 9986 | 42 | 2502 | 262 | 2752 |  | 3002 | 3127 | 32 |  |  | 362 | 43 |
| 44 | 99 | 99 | 99 |  |  |  | 9987 |  |  | 43 | 25 | 26 | 28 | 29 |  | 32 | 33 |  | 3584 | 371 | 44 |
| 45 | 99 | 99 | 99 | 9990 |  |  |  |  |  | 44． | 26 | 274 | 28 | 30 | 31 |  | 34 | 35 | 3665 | 379 | 45 |
| 46 | 9992 | 9991 | 9991 | 9990 | 9989 |  |  |  | 9985 | 45.998 | 2676 | 2810 | 2944 |  | 3211 |  | 3479 | 3613 | 3747 |  | 46 |
| 47 | 99 | 99 | 9 | 9989 | 9989 | 998 | 9987 | 9986 | 9984 | 46 | 2734 |  |  |  | 3281 |  | 3555 |  | 828 |  |  |
| 48 | 99 | 99 |  |  |  |  |  | 99 | 99 | 47 | 2792 | 29 |  |  |  | 34 | 3630 | 3770 |  |  | 48 |
|  | 99 |  |  |  |  | 9987 |  |  | 9984 |  | 2851 | 299 |  |  |  | 356 | 370 | 38 | 3991 | 413 | 49 |
| 50 | 999 | 999 | 9990 | 9989 | 9988 | 988 |  | 9985 | 9983 | 49.998 | 29 | 3054 | 3200 | 3345 | 349 | 3636 | 378 | 3927 | 407 | 421 | 50 |
| 51 | 99 | 999 | 9990 | 9989 |  | 9987 | 9985 | 9984 | 9983 | 50．998 | 296 |  |  | 3412 |  |  |  |  | 4154 |  | 51 |
| 52 | 99 | 99 | 9989 |  | 9987 | 998 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 52 |
| 53 | 999 | 99 | 9989 | 9988 | 9987 | 9986 |  | 9984 |  | 52 | 083 | 323 |  |  |  |  | 4008 | 4163 | 4317 |  | 53 |
| 5 | 991 |  |  |  |  |  |  |  |  | 53 | 314 | 32 | 34 |  |  | 39 | 40 | 42 | 43 |  | 54 |
| 55 | 99 | 9990 |  |  | 9987 |  | 9984 | 9983 |  | 54 | 320 | 336 | 35 | 3680 | 38 | 400 | 416 | 43 | 4480 | 464 | 55 |
|  | 9991 |  |  |  |  |  |  |  |  |  |  | 342 |  |  |  | 4072 | 4235 |  |  |  | 56 |
| 57 | 999 | 99 |  | 9987 | 998 | 998 | 9984 |  | 9981 | 56.99 | 331 | 3482 | 36 |  |  | 414 | 43 | 4477 | 4643 | 480 | 57 |
| 58 |  |  |  |  | 99 | 0985 | 983 |  |  |  |  | 35 |  |  |  | 42 |  |  |  | 489 | 58 |
| 59 | 9990 | 9989 | 9988 | 87 | 86 | 9984 | 983 | 9982 | 9980 | 58.99 |  |  |  |  | 41 |  | 446 |  |  | 4977 | 59 |
| 60 | 999 | 998 | 998 | 887 | 9985 | 998 | 9983 | 9982 | 9980 | 59.997 | 3491 | 366 | 38 | 40 | 41 | 436 | 453 | 4712 | 488 | 506 | 60 |
| 61 | 99 |  |  |  |  |  |  |  |  |  | 35 |  |  | 40 |  | 443 | 46 |  | 8 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 468 | 4869 |  |  |  |
| 63 | 99 | 99 | 9987 | 9986 | 9985 | 998 |  | 9981 | 9979 | 62.997 | 366 | 38 |  |  | 43 |  | 4765 | 4948 | 5131 |  | 63 |
| 64 |  |  |  |  |  |  |  |  |  | 63.987 | 372 | 391 | 40 | 42 | 44 | 46 |  |  |  |  | 64 |
| 65 | 99 |  |  |  |  |  |  |  |  | －997 |  |  |  |  |  |  |  |  |  |  | 65 |
| 66 | 99 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
| 67 | 998 | 99 |  | 9985 | 99 | 998 | 9981 |  | 99 | 66.97 | 389 | 409 | 428 | 4483 | 4677 | 487 | So | 5262 | 5457 | 565 | 67 |
|  |  |  |  |  |  |  |  |  | 9977 |  |  | 415 | 43 |  | 4747 | 49 | 51 | 5 |  |  | 68 |
| 69 | 998 | 9987 |  | 9985 | 9983 | 9982 | 9980 |  |  | \％ |  |  |  |  | 48 |  | 5218 | 5419 | 20 |  | 6 |
| 70 | 99 | 99 | 9986 | 9984 | 9983 | 9982 | 9980 | 9978 | 9977 | 69.997 | 407 | 427 | 448 | 468 | 4887 | 5090 | 529 | 549 | 5701 | 590 | 70 |
| 71 | 99 | 99 |  |  |  |  |  |  |  | 70 | ， | 433 | 4544 | 4750 | 495 |  |  | 5576 |  |  | 10 |
| 72 |  |  |  |  |  |  |  |  |  |  | 418 | 43 | 460 | 4817 | 5027 | 523 |  |  |  |  |  |
| 73 | 998 | 9986 | 99 | 99 | 9982 | 998 | 9979 | 99 | 99 | 72.9974 | 42 | 445 | 4672 | 4884 | 5096 | 530 | 55 | 5733 | 5946 | 615 | 73 |
| 7 |  |  |  |  |  | 9980 |  | 仿 | 9975 | 73.997 | 30 | 452 | 4736 | 4951 | 5166 | 538 | 5597 | 5812 | 6027 | 624 | 74 |
| 75 | 99 |  | 9985 | 9983 | 9982 | 998 |  |  | 9975 | 74．9973 | 436 |  |  |  |  | 518 | 587 |  |  |  | 75 |
| 76 | 998 |  | 9984 |  |  |  |  | 9977 | 9975 |  |  |  |  |  |  |  |  |  |  |  | 76 |
| 77 | 998 | 93 | 99 | 99 | 998 | 998 | 9978 | 9976 | 9974 | 76.997 | 448 | 470 | 4928 | 5152 | 537 | 56 | 58 | 6048 | 627 | 645 | 78 |
| 78 |  |  |  |  |  |  |  |  | 9974 |  | 453 | 47 | 4992 | 5219 | 5445 | 567 | 588 | 6126 | 6353 |  | 78 |
| 79 | 9987 | 9985 | 9984 | 9982 | 9981 | 9979 | 977 | 9976 | 9974 | 78.9972 | 459 | 4826 | 5056 | 5285 | 5515 | 574 | 597 | 6205 | 6434 | 666 | 79 |
| 80 | 99 | 9985 | 9984 | 9982 | 9980 | 997 | 9977 | 99 | 9973 | 79．9972 | 4654 | 488 | 512 | 53 | 5585 | 58 | 6050 | 6283 | 6516 | 6749 | 80 |
| 81 |  |  |  |  |  | 9979 | 9977 |  | 9973 |  | 年 | 4948 | 5184 | 5419 | 5655 | 5890 | 61 | 6362 | 6597 |  | 81 |
| 82 | 9986 | 9985 | 998 | 9982 | 9980 | 9978 | 9977 | 9975 | － | 1.99 | 4771 | 500 | 5248 | 548 | 5725 | 5963 | 6237 | 519 | 676 |  |  |
| 83 | 99 | 99 | 9983 | 99 | 9980 | 978 | 76 | 9974 | 9972 | 82.997 | 482 | 5070 | 5312 | 5553 | 5794 | 6036 | 6277 | 6519 | 6760 | 700 | 83 |
| 84 | 9986 | 析 | 983 | 981 | 9979 | 9978 | 976 | 9974 | 9972 | 83.9970 | 887 | 5131 | 5376 | 5620 | 586 | 610 | 635 | 6597 | 684 | 708 |  |
| 85 | 9986 | 9984 | 9983 | 9981 | 9979 | 9978 | 9976 | 9974 | 9972 | 84．997 | 494 | 5192 | 5440 | 568 | 593 | 618 | 64 | 667 | 692 | 717 |  |
|  | 99 | 998 | 998 | 998 | 9979 | 9977 | 975 | 9974 | 997 | 85.996 | 500 | 5253 | 5504 | 5754 | 6004 | 6254 | 6504 | 6754 | 7005 | 72 | 86 |
| 5 |  | 99 | ， | 9981 | 997 | 9977 | 9975 | 9973 | 9971 | 86.99 | 506 | 5314 | 5568 | 5821 | 6074 | 632 | 6580 | 6833 | 7086 | 733 |  |
| 88 | 99 | 998 | 9 | 9980 | 9979 | 9977 | 9975 | 9973 | 9970 | 87.996 | 5 | 5376 | 5632 | 588 | 6144 | 639 | 665 | 691 | 716 | 742 |  |
| 89 | 9985 | 9983 | 9982 | 9980 | 9978 | 9977 | 9975 | 73 | 9970 | 88．996 | 517 | 5437 | 5696 | 595 | 6213 | 6472 | 673 | 6990 | 724 | 75 |  |
| 90 | 9985 | 9983 | 9982 | 9980 | 9978 | 9976 | 9974 | 9972 | 997 | 89．9968 | 523 | 549 | 5760 | 602 | 628 | 654 | 6807 | \％ | \％ | 759 | 90 |
|  | 285 |  | 921 |  |  |  |  | 9972 | 9970 |  |  |  |  |  |  | 66 | 682 | 14 | 7412 |  |  |
| 92 | 9985 | 9983 | 9981 | 997 | 9978 | 9976 | 9974 | 9972 | 9969 | 91.996 | 5352 | 5620 | 5888 | 6155 | 6423 | 6690 | 6958 | 7226 | 7493 | 位 |  |
| 93 | 9984 | 9983 | 9981 | 9979 | 9977 | 9975 | 973 | 9971 | 9969 | 92.996 | 5410 | 5681 | 5952 | 6222 | 6493 | 6763 | 7034 | 7304 | 7575 | 784 |  |
| 94 | 998 | 998 | 9981 | 997 | 9977 | 9975 | 9973 | 9971 | 9969 | 93.996 | 462 | 5742 | 6016 | 628 | 656 | 683 | 109 | 7383 |  |  |  |
| 95 | 998 | 998 | 9981 | 997 | 9977 | 75 | 9973 | 9971 | 9968 | 94.996 | 552 | 5803 | 6080 | 6356 | 663 | 690 | 7185 | 746 | 7738 |  |  |
| 96 | 99 | 99 | 9980 | 9978 | 977 | 99 | 9973 | 9970 | 968 | 9596 | 55 | 5864 | 6144 | 6423 | 6702 | 69 | 7260 | 7540 | 7819 |  |  |
| 97 | 84 | 9982 | 980 | 9978 | 9976 | 9974 | 997 | 9970 | 9968 | 96.996 | 5643 | 5925 | 6208 | 649 | 6772 | 7054 | 7336 | 7618 | 790 | 818 |  |
|  | 9984 | 9982 | 9980 | 9978 | 9976 | 9974 | 9972 | 9970 | 9967 | 97.996 | 570 | 5986 | 6272 | 6557 | 6842 | 71 | 7412 | 7697 | 798 | 826 |  |
|  | 83 | 9981 | 9980 | 9978 | 9976 | 9974 | 972 | 9970 | 9967 | 98．9965 | 570 | 6048 | 6336 | 6623 | 6911 | 7199 | 7487 | 7775 | 8063 | 8351 |  |
| 100 | 9983 | 9981 | 9980 | 9978 | 9976 | 9974 | 9971 | 9969 | 9967 | 99．995 | 5818 | 6109 | 6400 | 6690 | 6981 | 7272 | 7563 | 7854 | 8145 | 3436 | 100 |
|  | 40＇1 | $39^{\prime}$ | $38^{\prime}$ | 37 | $36^{\prime}$ | $35^{\prime}$ | $34^{\prime}$ | $33^{\prime}$ | $32^{\prime}$ | $31^{\prime}$ |  | 39 |  | 37 | $36^{\prime}$ | $35^{\prime}$ | 34 | 33 | $32^{\prime}$ | $31^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.

| $0^{\circ}$ | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $0^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 50 | $5{ }^{\prime}$ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | $58^{\prime}$ | 59 | 50 | 51 | 52 | 53 | $54^{\prime}$ | $55^{\prime}$ | 56 | $57^{\prime}$ | $58^{\prime}$ | 59 |  |
|  | 9999 | 9999 | 9999 | 9999 | 1999 | 9999 | 9999 | 9999 | 9999 | 999 | 0145 | 0148 | 0151 | 0154 | 0157 | 0160 | 0163 | 0166 | 0169 | 0172 |  |
|  | 9998 | 9998 | 9998 | 9998 | 9998 | 9997 | 9997 | 9997 | 9997 | 1.9997 | 0291 | 0297 | 0303 | 0308 | 0314 | 0320 | 0326 | 0332 | 0337 | 0343 |  |
|  | 9997 | 9997 | 9997 | 9996 | 9996 | 9996 | 9996 | 9996 | 9996 | 2.9996 | 0436 | 0445 | 0454 | 0462 | 0471 | 0480 | 0489 | 0497 | 050 | 0515 |  |
|  | 9996 | 9996 | 9995 | 9995 | 9995 | 9995 | 9995 | 9995 | 9994 | 3.9994 | 0582 | 0593 | 0605 | 0617 | 0628 | 0640 | 0652 | 0663 | 0675 | 0686 |  |
| 5 | 9995 | 999 | 9994 | 9994 | 9994 | 9994 | 9993 | 9993 | 999 | 4.9993 | 0727 | 0742 | 075 | 0771 | 0785 | 0800 | 881 | 082 | 084 | Os, | 5 |
| 6 | 99 | 99 | 9993 | 9993 | 9993 | 99 | 99 | 99 | 99 | 5.99 | .0873 | 0890 | 09 | 0925 | 0942 | 0960 | 0977 | 09 | 1012 | 1030 | 6 |
| 7 | 999 | 9992 | 9992 | 9992 | 9991 | 9991 | 999 | 99 | 99 | 6.9990 | $\cdot 1018$ | 1038 | 1059 | 1079 | 1100 | 1120 | 1140 | 116 | 118 | 120 | 7 |
| 8 | 9992 | 9991 | 9991 | 9990 | 9990 | 9990 | 9989 | 9989 | 9989 | 7•9988 | 1164 | 1187 | 1210 | 1233 | 1257 | 1280 | 1303 | 1326 | 1350 | 1373 |  |
|  | 9990 | 9990 | 9990 | 9989 | 9989 | 9988 | 9988 | 9988 | 9987 | $8 \cdot 9987$ | 1309 | 1335 | 1361 | 138 | 1414 | 1440 | 1466 | 149 | 151 | 154 |  |
| 10 | 9989 | 9989 | 9989 | 9988 | 9988 | 9987 | 9987 | 9986 | 9986 | $9 \cdot 9985$ | 1454 | 1483 | 1513 | 1542 | 1571 | 1600 | 1629 | 1658 | 1687 | 1716 | 10 |
| 11 | 9988 | 9988 | 9987 | 9987 | 9986 | 9986 | 9985 | 9985 | 9984 | 10.9984 | 1600 | 1632 | 1664 | 1696 | 1728 | 1760 | 1792 | 1824 | 1856 | 188 | 1 |
| 12 | 9987 | 9987 | 9986 | 9986 | 9985 | 9985 | 9984 | 9984 | 9983 | 11.9982 | 1745 | 1780 | 1815 | 185 | 1885 | 1920 | 1955 | 1990 | 2024 | 2059 | 12 |
| 13 | 9986 | 9986 | 9985 | 9985 | 9984 | 9983 | 9983 | 9982 | 998 | 12.9981 | 1891 | 1929 | 1966 | 2004 | 2042 | 2080 | 2118 | 2155 | 2193 | 2231 | 13 |
| 14 | 9985 | 9985 | 9984 | 9983 | 9983 | 9982 | 9981 | 9981 | 9980 | 13.9979 | 2036 | 2077 | 2118 | 2158 | 2199 | 2240 | 2280 | 2321 | 2362 | 240 | 14 |
| 15 | 9984 | 9984 | 9983 | 9982 | 9981 | 998 | 9980 | 9979 | 997 | 14.9978 | 2182 | 2225 | 2269 | 231 | 2356 | 2400 | 2443 | 248 | 25 | 25 | 15 |
| 16 | 99 | 99 | 9982 | 9981 | 9980 | 998 | 9979 | 99 | 99 | 15.9976 | 2327 | 23 | 2420 | 24 | 2513 | 25 |  |  | 2699 | 2746 | 16 |
| 17 | 9982 | 9981 | 9981 | 9980 | 9979 | 9978 | 9977 | 9977 | 9976 | 16.997 | 2472 | 2522 | 2571 | 2621 | 2670 | 2720 | 2769 | 2819 | 28 | 29 | 17 |
| 18 | 9981 | 9980 | 9979 | 9979 | 9978 | 9977 | 9976 | 9975 | 9974 | 17-9973 | 2618 | 2670 | 2723 | 2775 | 2827 | 2880 | 2932 | 2984 | 3037 | 3089 | 18 |
| 19 | 9980 | 997 | 9978 | 9977 | 9977 | 9976 | 9975 | 9974 | 9973 | 18.9972 | 2763 | 2819 | 2874 | 2929 | 2984 | 3040 | 3095 | 315 | 320 | 32 | 19 |
| 20 | 9979 | 9978 | 9977 | 9976 | 9975 | 9974 | 9973 | 9973 | 9972 | 19.9971 | 2909 | 2967 | 3025 | 3083 | 3141 | 3200 | 3258 | 3316 | 337 | 343 | 20 |
| 21 | 9978 | 9977 | 9976 | 9975 | 9974 | 997 | 997 | 9971 | 9970 | 20 | 3054 | 31 | 317 | 32 | 3299 | 33 | 34 | 3482 | 3543 | 3604 | 21 |
| 22 | 9977 | 9976 | 9975 | 9974 | 9973 | 9972 | 9971 | 9970 | 9969 | 21.9968 | 3200 | 3264 | 3328 | 3392 | 3456 | 3520 | 3584 | 3648 | 3712 | 3776 | 22 |
| 23 | 9976 | 9975 | 9974 | 9973 | 9972 | 9971 | 9969 | 9968 | 9967 | 22.9966 | 3345 | 3412 | 3479 | 3546 | 3613 | 3680 | 3746 | 3813 | 3880 | 394 | 23 |
| 24 | 9975 | 9974 | 9973 | 9971 | 9970 | 9969 | 9968 | 9967 | 9966 | 23.9965 | 3491 | 3560 | 3630 | 3700 | 3770 | 3840 | 3909 | 3979 | 4049 | 41 | 24 |
| 25 | 997 | 73 | 9971 | 9970 | 9969 | 99 | 9967 | 66 | 9964 | 24.9963 | 636 | 3709 | 3781 | 3854 | 3927 | 4000 | 4072 | 414 | 42 | 42 | 25 |
| 26 | 9972 | \| 9971 | 9970 | 9969 | 9968 | 9967 | 9965 | 9964 | 99 | 25.9962 | 3781 | 385 | 393 | 4008 | 4084 | 4160 | 4235 | 4311 | 4386 | 4462 | 26 |
| 27 | 9971 | 9970 | 9969 | 9968 | 9967 | 9965 | 9964 | 9963 | 9962 | 26 | 392 | 4005 | 408 | 4162 | 424 | 4320 | 4398 | 4477 | 455 | 46 | 27 |
| 28 | 9970 | 9969 | 9968 | 9967 | 9965 | 9964 | 9963 | 9962 | 9960 | 27.9959 | 4072 | 4154 | 4235 | 4317 | 4398 | 4479 | 4561 | 4642 | 4724 | 4805 | 28 |
|  | 9969 | 9968 | 9967 | 9966 | 9964 | 9963 | 9962 | 9960 | 9959 | 28.99 | 4218 | 4302 | 4386 | 4471 | 4555 | 4639 | 4724 | 4808 | 4893 | 497 | 29 |
| 30 | 9968 | 9967 | 9966 | 9964 | 9963 | 9962 | 9960 | 9959 | 9957 | 29.9956 | 4363 | 4450 | 4538 | 4625 | 4712 | 4799 | 4887 | 4974 | 5061 | 5148 | 30 |
| 31 | 996 | 996 | 9965 | 9963 | 996 | 9960 | 9959 | 9957 | 9956 | $30^{\circ}$ | 4509 | 45 | 4689 | 477 | 486 | 49 | 0 | 514 | 5230 | 5320 | 31 |
| 32 | 9966 | 9965 | 9963 | 9962 | 9961 | 995 | 9958 | 9956 | 9954 | 31.9953 | 4654 | 4747 | 4840 | 4933 | 5026 | 5119 | 5212 | 530 | 539 | 54 | 32 |
| 33 | 9965 | 9964 | 9962 | 9961 | 9959 | 995 | 9956 | 9955 | 9953 | 32.9951 | 479 | 4895 | 4991 | 5087 | 5183 | 5279 | 5375 | 547 | 55 | 566 | 33 |
| 34 | 9964 | 9963 | 9961 | 9960 | 9958 | 9956 | 9955 | 9953 | 9952 | 33.9950 | 4945 | 5044 | 5143 | 5242 | 5340 | 5439 | 5538 | 5637 | 573 | 583 | 34 |
| 35 | 9963 | 9962 | 9960 | 9958 | 9957 | 995 | 9954 | 9952 | 9950 | 34.9948 | 5090 | 5192 | 5294 | 539 | 5498 | 559 | 570 | 5803 | 590 |  | 35 |
| 36 | 9962 | 19960 | 9959 | 9957 | 9956 | 9954 | 9952 | 9951 | 9949 | $35 \cdot 9947$ | 5236 | 5341 | 5445 | 5550 | 5655 | 5759 | 5864 | 5969 | 6073 | 617 | 36 |
| 37 | 9961 | 9959 | 9958 | 9956 | 9954 | 9953 | 9951 | 9949 | 9947 | 36.9945 | 5381 | 5489 | 5596 | 5704 | 5812 | 5919 | 6027 | 6135 | 624 | 635 | 37 |
| 38 | 9960 | 9958 | 9957 | 9955 | 9953 | 9951 | 9950 | 9948 | 9946 | $37 \cdot 9944$ | 52 | 5637 | 5748 | 5858 | 596 | 6079 | 6190 | 6300 | 641 | 652 | 38 |
| 39 | 9959 | 995 | 9955 | 9954 | 9952 | 9950 |  | 994 |  | 38.9943 | 567 | 5786 | 5899 | 6012 | 6126 | 6239 | 6353 | 6466 | 6580 | 669 | 39 |
| 40 | 9958 | 9956 | 9954 | 9952 | 9951 | 9949 | 994 | 9945 | 9943 | 39.9941 | 5818 | 5934 | 6050 | 6167 | 6283 | 6399 | 6516 | 6632 | 6748 | 686 | 40 |
| 41 | 9957 | 9955 | 9953 | 9951 | 9949 | 9948 | 9946 | 9944 | 9942 | 40 | 5963 | 608 | 62 | 632 | 64 | 65 | 6678 | 6798 | 6917 | 7036 | 41 |
| 42 | 99 | 995 | 9952 | 9950 | 9948 | 946 | 9944 | 9942 | 9940 | 41.9938 | 6108 | 6231 | 6353 | 6475 | 6597 | 6719 | 6841 | 696 | 708 | 720 | 42 |
| 43 | 9955 | 9953 | 9951 | 9949 | 9947 | 9945 | 9943 | 9941 | 9939 | 42.9937 | 6254 | 6379 | 6504 | 6629 | 6754 | 6879 | 7004 | 712 | 725 | 737 | 43 |
| 44 | 99 | 9952 | 9950 | 9948 | 9946 | 9944 | 9942 | 9940 | 9937 | 43 '9935 | 6399 | 6527 | 6655 | 6783 | 6911 | 7039 | 7167 | 729 | 742 | 7551 | 44 |
| 45 | 9952 | 9951 | 9949 | 47 | 9944 | 9942 | 9940 | 9938 | 9936 | 44 | 6545 | 6676 | 6807 | 6937 | 706 | 719 | 733 | 746 | 759 | 7723 | 45 |
| 46 | 9951 | 9949 | 9947 | 9945 | 9943 | 9941 | 9939 | 9937 | 9935 | 45.9932 | 669 | 6824 | 6958 | 709 | 7225 | 7359 | 7493 | 7627 | 776 | 789 | 46 |
| 47 | 9950 | 9948 | 9946 | 994 | 9942 | 9940 | 9938 | 9935 | 9933 | 46.9931 |  | 6972 | 7109 | 724 | 7382 | 7519 | 7656 | 7793 | 792 | 806 | 47 |
| 48 | 9949 | 9947 | 9945 | 9943 | 9941 | 9939 | 9936 | 9934 | 9932 | 47.9929 | 691 | 7121 | 7260 | 7400 | 7540 | 7679 | 7819 | 7958 | 809 | 823 | 48 |
| 49 | 9948 | 9946 |  | 9942 | 9940 | 9937 | 9935 | 9933 | 9930 | 48.9928 | 7127 | 7269 | 7412 | 7554 | 7697 | 7839 | 7982 | 8124 | 826 | 840 | 49 |
| 50 | 9947 | 9945 | 9943 | 9941 | 9938 | 9936 | 9934 | 9931 | 9929 | 49.9926 | 7272 | 7417 | 7563 | 7708 | 7854 | 7999 | 8145 | 8290 | 8435 | 858 | 50 |
| 51 | 99 | 9944 | 9942 | 9939 | 9937 | 9935 | 9932 | 9930 | 9927 | 50.9925 | 7417 | 75 | 77 | 7862 | 8011 | 81 | \% | 8456 | 8604 | 8752 | 51 |
| 52 | 994 | 99 | 9941 | 9938 | 9936 | 9933 | 9931 | 9929 | 9926 | 51.9923 | 7563 | 7714 | 7865 | 8017 | 8168 | 8319 | 8470 | 862 | 8773 | 89 | 52 |
| 53 | 9944 | 9942 | 9939 | 9937 | 9935 | 9932 | 9930 | 9927 | 9925 | 52.9922 | 7708 | 7862 | 8017 | 8171 | 8325 | 8479 | 8633 | 8787 | 894 | 90 | 53 |
| 54 | 9943 | 9941 | 9938 | 9936 | 9933 | 9931 | 9928 | 9926 | 9923 | 53.9920 | 7854 | 8011 | 8168 | 8325 | 8482 | 8639 | 8796 | 8953 | 9110 | 9267 | 54 |
| 55 | 9942 | 9940 | 9937 | 9935 | 9932 | 9930 | 9927 | 24 | 22 | 54.9919 | 7999 | 8159 | 8319 | 8479 | 8639 | 879 | 8959 | 9119 | 9279 | 9439 | 55 |
| 56 | 9941 | \|9938 | 9936 | 9933 | 9931 | 9928 | 9926 | 9923 | 9920 | 55.9918 | 14 | 830 | 8470 | 8633 | 8796 | 8959 | 9122 | 9285 | 944 |  | 56 |
| 57 | 9940 | 9937 | 993 | 9932 | 9930 | 9927 | 9924 | 9922 | 9919 | 56.9916 | 829 | 845 | 8622 | 8787 | 8953 | 9119 | 9285 | 9451 | 961 | 9782 | 57 |
| 58 | 9939 | 9936 | 9934 | 9931 | 9928 | 9926 | 9923 | 9920 | 9917 | 57.9915 | 8435 | 8604 | 8773 | 8942 | 9110 | 9279 | 9448 | 9616 | 978 | 9954 | 58 |
| 59 | 9938 | 9935 | 9933 | 9930 | 9927 | 9924 | 9922 | 9919 | 9916 | 58.9913 | 8581 | 8753 | 8924 | 9096 | 9267 | 9439 | 9611 | 9782 | 9954 | -12 | 59 |
| 60 | 9937 | 9934 | 9931 | 9929 | 9926 | 9923 | 9920 | 9918 | 9915 | 59.9912 | -8726 | 8901 | 9075 | 9250 | 9424 | 9599 | 9773 | 9948 | 1122 | 029 | 60 |
| 61 | 9935 | 9933 | 99 | 9928 | 9925 | 9922 | 9919 | 9916 | 9913 | 60.9910 |  | 9049 | 9227 | 9404 |  | 9759 | 9936 | -114 | 029 |  | 61 |
| 62 | 9934 | 9932 | 9929 | 9926 | 9923 | 9921 | 9918 | 9915 | 9912 | 61.9909 | 9017 | 9198 | 9378 | 9558 | 9739 | 9919 | 1099 | 0280 | 0460 | 064 | 62 |
| 63 | 9933 | 9931 | 9928 | 9925 | 9922 | 9919 | 9916 | 9913 | 9910 | 62.9907 | 9163 | 9346 | 9529 | 9712 | 9896 | -079 | 0262 | 0445 | 0629 | 0812 | 63 |
| 64 | 9932 | 9930 | 9927 | 9924 | 99 | 9918 | 15 | 9912 | 9909 | 63.9906 | 308 | 9494 | 9680 | 9867 | -053 | 0239 | 0425 | 0611 | 0797 | 0983 | 64 |
| 65 | 9931 | 99 | 99 | 23 | 9920 | 17 | 9914 | 9911 | 9908 | 64.9904 | 445 | 9643 | 983 | -02 | 0210 | 039 | 05 | 077 | 096 | 115 | 65 |
|  | 9930 | 992 | 9924 | 9922 | 9919 | 9916 | 9912 | 9909 | 9906 | 65.9903 | 9599 | 9791 | 9983 | -175 | 0367 | 0559 | 0751 | 0943 | 113 | 132 | 66 |
| 67 | 9929 | 9926 | 9923 | 9920 | 9917 | 9914 | 9911 | 9908 | 9905 | $66 \cdot 990$ | 744 | 9939 | +134 | 0329 | 0524 | 0719 | 0914 | 1109 | 1303 | 1498 | 67 |
| 68 | 9928 | 9925 |  | 9919 | 99 | 9913 | 9910 | 9907 | 9903 | 67.9900 | 890 | -088 | 0285 | 0483 | 0681 | 0879 | 1077 | 1274 | 1472 | 1 | 68 |
| 69 | 9927 | 9924 | 9921 | 9918 | 9915 | 9912 | 9908 | 9905 | 9902 | 68.9898 | 1.0035 | 0236 | 0437 | 0637 | 0838 | 1039 | 1239 | 1440 | 164 | 1842 | 69 |
| 70 | 9926 | 9923 | 9920 | 9917 | 9914 | 9910 | 9907 | 9904 | 9900 | 69.9897 | 1.0181 | 0384 | 0588 | 0792 | 0995 | 1199 | 1402 | 1606 | 180 | 201 | 70 |
| 71 | 9925 | 9922 | 9919 | 9916 | 9912 | 9909 | 9906 | 9902 | 9899 | 70.989 | 1.0326 | 0533 | 0739 | 0946 | 115 | 1359 | 1565 | 1772 | 197 | 218 | 71 |
| 72 | 9924 | 9921 | 9918 | 9914 | 9911 | 9908 | 9904 | 9901 | 9898 | 71.9894 | 1.0472 | 0681 | 0890 | 1100 | 1309 | 1519 | 1728 | 1938 | 214 | 235 | 72 |
| 73 | 9923 | 9920 | 9916 | 9913 | 99 | 9907 | 9903 | 9900 | 9896 | 72.9892 | 1.0617 | 0829 | 1042 | 1254 | 1466 | 1679 | 1891 | 2103 | 2316 | 2528 | 73 |
| 74 | 9922 | 9919 | 9915 | 9912 | 9909 | 9905 | 9902 | 9898 | 9895 | 73.9891 | 1.0762 | 0978 | 1193 | 1408 | 1623 | 1839 | 2054 | 2269 | 2484 | 270 | 74 |
| 75 | 9921 | 9918 | 9914 | 9911 | 9907 | 9904 | 9900 | 9897 | 9893 | 74.9890 | 1.0908 | 1126 | 1344 | 1562 | 178 | 199 | 2217 | 243 | 265 | 287 | 75 |
| 76 | 9920 | 9916 | 9913 | 9910 | 9906 | 9903 | 9899 | 9896 | 9892 | 75.9888 | 1.1053 | 1274 | 1495 | 1717 | 1938 | 2159 | 2380 | 2601 | 2822 | 304 | 76 |
| 77 | 9919 | 9915 | 9912 | 9909 | 9905 | 9901 | 9898 | 9894 | 9890 | 76.9887 | 1-1199 | 1423 | 1647 | 1871 | 2095 | 2319 | 2543 | 2767 | 299 | 321 | 77 |
| 78 | 9917 | 9914 | 9911 | 9907 | 9904 | 9900 | 9896 | 9893 | 9889 | $77 \cdot 9885$ | $1 \cdot 1344$ | 1571 | 1798 | 2025 | 2252 | 2479 | 2705 | 2932 | 315 | 338 | 78 |
| 79 | 9916 | 9913 | 9910 | 9906 | 9903 | 9899 | 9895 | 9891 | 9888 | 78.9884 | 1.1490 | 1719 | 1949 | 2179 | 2409 | 2639 | 2868 | 3098 | 3328 | 3558 | 79 |
| 80 | 9915 | 9912 | 9908 | 9905 | 9901 | 9898 | 9894 | 9890 | 9886 | 79.9882 | 1.1635 | 1868 | 2100 | 2333 | 2566 | 2799 | 3031 | 326 | 349 | 3729 | 80 |
| 81 | 9914 | 9911 | 9907 | 9904 | 9900 | 9896 | 9893 | 9889 | 9885 | 80'988 | $1 \cdot 1781$ | 2016 | 2252 | 2487 | 2723 | 2959 | 3194 | 3430 | 3665 | 390 | 81 |
| 82 | 9913 | 9910 | 9966 | 9903 | 9899 | 9895 | 9891 | 9887 | 9883 | 81.9879 | 1-1926 | 2165 | 2403 | 2642 | 2880 | 3119 | 3357 | 3596 | 383 | 4073 | 82 |
| 83 | 9912 | 9909 | 9905 | 9901 | 98 | 9894 | 9890 | 9886 | 9882 | 82.9878 | $1 \cdot 2071$ | 2313 | 2554 | 2796 | 3037 | 3279 | 3520 | 3761 | 4003 | 4244 | 83 |
| 84 | 9911 | 9908 | 9904 | 9900 | 9896 | 989 | 9889 | 9885 | 9880 | 83.9876 | $1 \cdot 2217$ | 2461 | 2706 | 2950 | 3194 | 3438 | 3683 | 3927 | 417 | 441 | 84 |
| 85 | 9910 | 9907 | 9903 | 9899 | 9895 | 989 | 9887 | 9883 | 9879 | 84.9875 | 12362 | 2610 | 2857 | 3104 | 3351 | 359 | 384 | 409 | 434 | 458 | 85 |
| 86 | 9909 | 9905 | 9902 | 9898 | 9894 | 9890 | 9886 | 9882 | 9878 | 85.9873 | $1 \cdot 2508$ | 2758 | 3008 | 3258 | 3508 | 3758 | 4009 | 4259 | 450 | 475 | 86 |
| 87 | 9908 | 9904 | 9900 | 9897 | 9893 | 9889 | 9885 | 9880 | 9876 | 86.9872 | $1 \cdot 2653$ | 2906 | 3159 | 3412 | 3665 | 3918 | 4171 | 4425 | 4678 | 493 | 87 |
| 88 | 9907 | 9903 | 9899 | 9895 | 9891 | 9887 | 9883 | 9879 | 9875 | 87.9870 | $1 \cdot 2799$ | 3055 | 3311 | 3567 | 3822 | 4078 | 4334 | 4590 | 484 | 5102 | 88 |
| 89 | 9906 | 9902 | 9898 | 9894 | 9890 | 9886 | 9882 | 9878 | 9873 | 88.9869 | 1-2944 | 3203 | 3462 | 3721 | 3979 | 4238 | 4497 | 4756 | 5015 | 5274 | 89 |
| 90 | 9905 | 9901 | 97 | 9893 | 9889 | 9885 | 9881 | 9876 | 9872 | 89.9867 | 1.3090 | 3351 | 3613 | 3875 | 4137 | 4398 | 4660 | 4922 | 518 | 544 | 90 |
| 91 | 9904 | 9900 | 9896 | 9892 | 9888 | 9884 | 9879 | 9875 | 9871 | 90.986 | 1.3235 | 3500 |  | 4029 | 4294 | 4558 | 4823 | 5088 | 535 | 561 | 寺 |
| 92 | 9903 | 9899 | 9895 | 9891 | 9886 | 9882 | 9878 | 9874 | 9869 | 91.9864 | 1.3380 | 3648 | 3916 | 4183 | 4451 | 4718 | 4986 | 5254 | 5521 | 518 | 92 |
| 93 | 9902 | 9898 | 9894 | 9890 | 9885 | 9881 | 9877 | 9872 | 9868 | 92.9863 | $1 \cdot 3526$ | 3796 | 4067 | 4337 | 4608 | 4878 | 5149 | 5419 | 5690 | 596 | 93 |
| 94 | 9901 | 9897 | 9892 | 9888 | 9884 | 9880 | 9875 | 9871 | 9866 | 93.9862 | $1 \cdot 3671$ | 3945 | 4218 | 4492 | 4765 | 5038 | 5312 | 5585 | 5858 | 6132 | 94 |
| 95 | 9899 | 9896 | 9891 | 9887 | 83 | 9878 | 9874 | 9869 | 9865 | 94.9860 | $1 \cdot 3817$ | 4093 | 4369 | 4646 | 4922 | 5198 | 5475 | 5751 | 6027 | 6 | 95 |
| 96 | 9898 | 9894 | 9890 | 9886 | 9882 | 9877 | 9873 | 9868 | 9863 | 95.9859 | $1 \cdot 3962$ | 4241 | 4521 | 4800 | 5079 | 5358 | 5637 | 5917 | 6196 | 6475 | 96 |
| 97 | 9897 | 9893 | 9889 | 9885 | 9880 | 9876 | 9871 | 9867 | 9862 | 96.9857 | 14108 | 4390 | 4672 | 4954 | 5236 | 5518 | 5800 | 6083 | 636 | 664 | 97 |
| 9 | 9896 | 9892 | 9888 | 9884 | 9879 | 9875 | 9870 | 9865 | 9861 | 97.9856 | 1.4253 | 4538 | 4823 | 5108 | 5393 | 5678 | 5963 | 6248 | 653 | 6818 | 98 |
| 99 | 9895 | 9891 | 9887 | 9882 | 9878 | 9873 | 9869 | 9864 | 9859 | 98.9854 | $1 \cdot 4398$ | 4686 | 4974 | 5262 | 5550 | 5838 | 6126 | 6414 | 670 |  |  |
| 100 | 9894 | 9890 | 9886 | 881 | 9877 | 9872 | 9867 | 9863 | 9858 | 99.9853 | $1 \cdot 4544$ | 4835 | 5126 | 5417 | 5707 | 5998 | 6289 | 6580 | 6871 | 7162 | 100 |
|  | $10^{\circ}$ | $9^{\prime}$ | 8 | $7{ }^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | ${ }^{\prime}$ |  | $0^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ |  | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ |  |  |  |  |
| 89 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Cos | NE. |  |  |  |  | $3^{\circ}$ |

TRAVERSE TABLES．

| $1{ }^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $1{ }^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | $l^{\prime}$ | $2^{\prime}$ | $3^{\prime}$ | $4^{\prime}$ | $5^{\prime}$ | $6^{\prime \prime}$ | $7{ }^{\prime}$ | 8 | $9^{\prime}$ | $0^{\prime}$ | $1^{\prime}$ | $2^{\prime}$ | $3^{\prime}$ | $4^{\prime} 1$ | $5^{\prime}$ | $6^{\prime}$ | $7^{\prime}$ | $8{ }^{\prime}$ | ＇ |  |
|  | 999 | 9998 | 9998 | 9998 | 9998 | 9998 | 9998 | 9998 | 9998 | ．9998 | 0175 | 0177 | 0180 | 0183 | 0186 | 0189 | 0192 | 195 | 198 | 0201 |  |
|  | 999 | 9997 | 9997 | 9997 | 9997 | 9996 | 9996 | 9996 | 9996 | 1.9996 | 034 | 0355 | 0361 | 0366 | 0372 | 0378 | 0384 | 0390 | 0396 | 0401 |  |
|  | 9995 | 9995 | 9995 | 9995 | 9995 | 9995 | 9994 | 9994 | 9994 | 2.9994 | 0524 | 0532 | 0541 | 0550 | 0558 | 0567 | 0576 | 0585 | 0593 | 0602 |  |
|  | 9994 | 9994 | 9993 | 9993 | 9993 | 9993 | 9993 | 9992 | 9992 | 3.9992 | －0698 | 0710 | 0721 | 0733 | 0745 | 0756 | 0768 | 0780 | 0791 | 0803 |  |
| 5 | 9992 | 9992 | 9992 | 9992 | 9991 | 9991 | 9991 | 9991 | 9990 | 4.9990 | ． 0873 | 0887 | 0902 | 091 | 0931 | 0945 | 0960 | 0974 | 0989 | 1003 | 5 |
| 6 | 9991 | 19991 | 90 | 9990 | 99 | 99 | 9989 | 9989 | 9988 | 5 | －1047 | 55 | 1082 | 1099 | 1117 | 34 | 152 | 1169 | 1187 | 1204 | 6 |
|  | 9989 | 9989 | 9989 | 9988 | 9988 | 9987 | 9987 | 9987 | 9986 | 6.9986 | －1222 | 1242 | 1262 | 1283 | 1303 | 1323 | 1344 | 1364 | 1385 | 14 |  |
| 8 | 9988 | 9987 | 9987 | 9987 | 9986 | 9986 | 9985 | 9985 | 9984 | 7.9984 | $\cdot 1396$ | 1419 | 1443 | 1466 | 1489 | 1513 | 1536 | 1559 | 1582 | 1606 |  |
|  | 9986 | 9986 | 9985 | 9985 | 9984 | 9984 | 9983 | 9983 | 9982 | 8.9982 | $\cdot 1571$ | 1597 | 1623 | 1649 | 1675 | 1702 | 1728 | 1754 | 1780 | 1806 |  |
| 10 | 9985 | 9984 | 9984 | 9983 | 9983 | 9982 | 9982 | 9981 | 9980 | 9.9980 | 1745 | 1774 | 1803 | 1832 | 1862 | 1891 | 1920 | 1949 | 1978 | 200 | 10 |
| 11 | 9983 | 9983 | 9982 | 9982 | 9981 | 9980 | 9980 | 9979 | 9978 | 10.997 | $\cdot 1920$ | 1952 | 1984 | 201 | 2048 | 2080 | 2112 | 2144 | 2176 | 22 | 11 |
| 12 | 9982 | 9981 | 9980 | 9980 | 9979 | 9979 | 9978 | 9977 | 9977 | 11.9976 | 2094 | 2129 | 2164 | 2199 | 2234 | 2269 | 2304 | 2339 | 2373 | 24 | 12 |
| 13 | 9980 | 9980 | 9979 | 9978 | 9977 | 9977 | 9976 | 9975 | 9975 | 12.9974 | 2269 | 2307 | 2344 | 2382 | 2420 | 2458 | 2496 | 2533 | 2571 | 2609 | 13 |
| 14 | 9979 | 9978 | 9977 | 9976 | 9976 | 9975 | 9974 | 9973 | 9973 | 13.9972 | 2443 | 2484 | 2525 | 2565 | 2606 | 2647 | 2688 | 2728 | 2769 | 2810 | 14 |
| 15 | 9977 | 9976 | 9976 | 9975 | 997 | 9973 | 9972 | 9972 | 997 | 14：9970 | 2618 | 2661 | 2705 | 2749 | 2792 | 2836 | 2880 | 2923 | 2967 | 3010 | 15 |
| 16 | 9976 | 9975 | 9974 | 1973 | ｜997 | 997 | 9971 | 70 | 996 | 15.9968 | 2792 | 28 | 2885 | 2932 | 2979 | 30 | 3072 | 18 | 3165 | 3211 | 16 |
| 17 | 997 | 9973 | 9972 | 9971 | 997 | 9970 | 9969 | 9968 | 996 | 16.996 | 296 | 3016 | 3066 | 3115 | 3165 | 3214 | 3264 | 3313 | 3362 | 3412 | 17 |
| 18 | 9973 | 9972 | 9971 | 9970 | 9969 | 9968 | 9967 | 9966 | 9965 | 17.9964 | －3141 | 3194 | 3246 | 3298 | 335 | 3403 | 3456 | 3508 | 35 | 3613 | 18 |
| 19 | 9971 | 9970 | 9969 | 9968 | 996 | 9966 | 9965 | 9964 | 9963 | 18.9962 | 3316 | 3371 | 3426 | 3482 | 3537 | 3592 | 3648 | 3703 | 37 | 38 | 19 |
| 20 | 9970 | 9969 | 9967 | 9966 | 9965 | 9964 | 9963 | 9962 | 9961 | 19.9960 | 3490 | 3549 | 3607 | 3665 | 3723 | 3781 | 3839 | 3898 | 3956 | 401 | 20 |
| 21 | 9968 | 996 | 9966 | 9965 | 19964 | 9962 | 9961 | 9960 | 9959 | 20．9958 | ． 36 | 3726 | 3787 | 3848 | 390 | 3970 | 4031 | 4093 | 4154 | 42 | 21 |
| 22 | 996 | 9965 | 9964 | 9963 | 9962 | 9961 | 9959 | 9958 | 9957 | 21.9956 | 3840 | 3904 | 3968 | 4031 | 4095 | 4159 | 4223 | 4287 | 4351 | 44 | 22 |
| 23 | 9965 | 9964 | 9963 | 9961 | 996 | 9959 | 9958 | 9956 | 9955 | 22.9954 | 4014 | 4081 | 4148 | 4215 | 4282 | 4349 | 4415 | 4482 | 4549 | 461 | 23 |
| 24 | 9963 | 9962 | 9961 | 9960 | 99 | 9957 | 9956 | 9954 | 9953 | $23 \cdot 9952$ | 189 | 4258 | 4328 | 4398 | 4468 | 4538 | 4607 | 4677 | 4747 | 481 | 24 |
| 25 | 996 | 9961 | 50 | 58 | 99 | 9955 | 9954 | 9953 | 51 | 24．9950 | 4363 | 36 | 4509 | 4581 | 4654 | 4727 | 4799 | 4872 | 4945 | 5017 | 25 |
| 26 | 9960 | 9959 | 9958 | 9956 | 995 | 995 | 9952 | 951 | 9949 | 25.9948 | 538 | 4613 | 4689 | 4764 | 4840 | 4916 | 4991 | 506 | 5143 | 5218 | 26 |
| 27 | 9959 | 9958 | 9956 | 9955 | 9953 | 9952 | 9950 | 9949 | 9947 | 26.9946 | 4712 | 4791 | 4869 | 4948 | 5026 | 5105 | 5183 | 5262 | 5340 | 5419 | 27 |
| 28 | 9957 | 9956 | 9954 | 9953 | 9951 | 9950 | 9948 | 9947 | 9945 | 27.9944 | 4887 | 4968 | 5050 | 5131 | 52 | 5294 | 5375 | 5457 | 5538 | 562 | 28 |
| 29 | 9956 | 9954 | 9953 | 9951 | 9950 | 9948 | 9947 | 9945 | 9943 | 28.9942 | 5061 | 5146 | 5230 | 5314 | 5399 | 5483 | 5567 | 5652 | 5736 | 5820 | 29 |
| 30 | 9954 | 9953 | 9951 | 9950 | 9948 | 9946 | 9945 | 9943 | 9941 | 29.9940 | 5236 | 5323 | 5410 | 5497 | 558 | 5672 | 5759 | 584 | 5934 | 602 | 30 |
| 31 | 995 | 9951 | 995 | 9948 | 994 | 9945 | 9943 | 9941 | 993 | 30.993 | 541 | 5500 | 55 | 5681 | 5771 | 5861 | 5951 | 6041 | 6132 | 6222 | 31 |
| 32 | 995 | 9950 | 48 | 9946 | 99 | 9943 | 9941 | 9939 | 9937 | 31.9936 | 5585 | 5678 | 5771 | 586 | 5957 | 6050 | 6143 | 6236 | 6329 | 64 | 2 |
| 33 | 9950 | 9948 | 9946 | 9945 | 9943 | 99 | 9939 | 9937 | 9935 | 32.9934 | 5759 | 5855 | 5951 | 6047 | 6143 | 6239 | 6335 | 6431 | 6527 | 662 | 33 |
| 34 | 9948 | 9946 | 9945 | 99 | 99 | 99 | 9937 | 9935 | 9933 | 33.9932 | 5934 | 6033 | 6132 | 623 | 63 | 6428 | 6527 | 662 | 67 | 682 | 34 |
| 35 | 994 | 9945 | 9943 | 9941 | 9939 | 9937 | 9935 | 9934 | 9932 | 34．9930 | 6108 | 10 | 12 | 641 | 6516 | 617 | 6719 | 682 | 692 | 7024 | 35 |
| 36 | 9945 | 9943 | 41 | 40 | 19938 | ｜9936 | 9934 | 932 | 9930 | 35.9927 | 6283 | 6388 | 6492 | 6597 | 6702 | 6806 | 6911 | 701 | 20 | 225 | 36 |
| 37 | 9944 | 9942 | 9940 | 9938 | 9936 | 9934 | 9932 | 9930 | 9928 | 36.99 | 645 | 6565 | 6673 | 678 | 688 | 6995 | 7103 | 721 | 7318 | 742 | 37 |
| 38 | 9942 | 9940 | 9938 | 9936 | 9934 | 9932 | 9930 | 9928 | 9926 | $37 \cdot 9923$ | 6632 | 6742 | 6853 | 6963 | 7074 | 7185 | 7295 | 7406 | 7516 | 76 | 38 |
| 39 | 9941 | 9939 | 9937 | 9935 | 9932 | 9930 | 9928 | 9926 | 9924 | 38.9921 | 6806 | 6920 | 7033 | 7147 | 7260 | 7374 | 7487 | 7600 | 7714 | 7827 | 39 |
| 40 | 9939 | 9937 | 9935 | 9933 | 9931 | 9929 | 9926 | 9924 | 9922 | 39．9919 | 6981 | 7097 | 7214 | 7330 | 744 | 7563 | 7679 | 7795 | 7912 | 8028 | 40 |
| 41 | 9938 | 9935 | 9933 | 9931 | 9929 | 9927 | 24 | 9922 | 9920 | $40^{\circ}$ | 7155 | 727 | 7394 | 7513 | 76 | 7752 | 7871 | 7990 | 8109 | 8229 | 41 |
| 42 | 9936 | 9934 | 32 | 29 | 992 | 9925 | 23 | 920 | 9918 | 41.9915 | 7330 | 7452 | 7574 | 7696 | 7819 | 7941 | 8063 | 8185 | 8307 | 842 | 42 |
| 43 | 9935 | 9932 | 9930 | 9928 | 992 | 9923 | 9921 | 9918 | 9916 | 42.9913 | 750 | 7630 | 7755 | 7880 | 8005 | 8130 | 8255 | 8380 | 8505 | 863 | 43 |
| 44 | 9933 | 9931 | 9928 | 9926 | 9924 | 9921 | 9919 | 9916 | 9914 | $43 \cdot 9911$ | 7679 | 7807 | 7935 | 8063 | 8191 | 8319 | 8447 | 8575 | 8703 | 883 | 44 |
| 45 | 9931 | 9929 | 9927 | 9924 | 9922 | 9920 | 17 | 9915 | 9912 | 44．9909 | 7854 | 7984 | 8115 | 8246 | 8377 | 508 | 863 | 8770 | 890 | 903 | 45 |
| 46 | 9930 | 9928 | 25 | 23 | 9920 | 9918 | 9915 | 9913 | 9910 | 45.990 | 8028 | 8162 | 8296 | 8429 | 856 | 8697 | 331 | 3965 |  | 232 | 46 |
| 47 | 9928 | 9926 | 9924 | 9921 | 9919 | 9916 | 9913 | 9911 | 990 | $46^{\prime} 99$ | 820 | 8339 | 847 |  | 87 | 8886 | 9023 | 9160 | 9296 |  | 47 |
| 48 | 9927 | 9924 | 9922 | 9919 | 9917 | 9914 | 9912 | 9909 | 9906 | $47 \cdot 9903$ | 8377 | 8517 | 8656 | 8796 | 8936 | 9075 | 9215 | 9354 | 9494 | 9634 | 48 |
| 49 | 9925 | 9923 | 9920 | 9918 | 9915 | 9912 | 9910 | 9907 | 9904 | 48.9901 | －8552 | 8694 | 8837 | 8979 | 9122 | 9264 | 9407 | 9549 | 9692 | 9834 | 49 |
| 50 | 9924 | 9921 | 9919 | 9916 | 9913 | 9911 | 9908 | 9905 | 9902 | 49.9899 | ． 8726 | 8872 | 9017 | 9162 | 9308 | 9453 | 9599 | 9744 | 9890 | 035 | 50 |
| 51 | 9922 | 9920 | 9917 | 9914 | 9912 | 9909 | 9906 | 9903 | 9900 | 50．9897 | 8901 | 90 | 9197 | 93 | 94 | 9642 | 9791 | 9939 | －087 |  | 51 |
| 5 | 9921 | 9918 | 15 | 9913 | 9910 | 07 | 04 | 9901 | 9898 | 51.98 | 9075 | 9226 | 9378 | 9529 | 9680 | 9831 | 9983 | －134 | 85 |  | 52 |
| 53 | 9919 | 9917 | 9914 | 9911 | 9908 | 9905 | 9902 | 9899 | 9896 | 52.9893 | ． 9250 | 9404 | 9558 | 9712 | 9866 | ＋020 | 0175 | 0329 | 0483 | 063 | 53 |
| 54 | 9918 | 9915 | 9912 | 9909 | 9906 | 9904 | 9900 | 9897 | 9894 | 53．989 | 9424 | 9581 | 9738 | 9895 | －053 | 0210 | 0367 | 0524 | 0681 | 083 | 54 |
| 55 | 9916 | 13 | 9911 | 9908 | 99 | 02 | 9 | 9896 | 9892 | 54.9889 | 9599 | 9759 | 9919 | ＋079 | 023 | 399 | 055 | 07 | 0879 | 103 | 55 |
| 56 | 9915 | 9912 | 9909 | 906 | 990 | 9900 | 97 | 9894 | 9890 | 5.988 | ． 9773 | 9936 | 99 | 0262 | 0425 | 0588 | 0751 | 0913 | 1076 | 1239 | 56 |
| 57 | 9913 | 9910 | 990 | 99 | 9901 | 989 | 98 | 98 | 988 | 56.9885 | －9948 | －1 | 027 | 04 | 06 | 0777 | 094 | 11 | 1274 | 1440 | 57 |
| 58 | 9912 | 9 | 9906 | 9903 | 9899 | 9896 | 9893 | 9890 | 9887 | 57.9883 | ． 0122 | 0291 | 0460 | 0628 | 0797 | 0966 | 1134 | 1303 | 1472 | 164 | 58 |
| 59 | 9910 | 9907 | 9904 | 9901 | 9898 | 9895 | 9891 | 9888 | 9885 | 58.9881 | 1.0297 | 0468 | 0640 | 0812 | 0983 | 1155 | 1326 | 1498 | 1670 | 184 | 59 |
| 60 | 9909 | 9906 | 9902 | 9899 | 9896 | 9893 | 9889 | 9886 | 9883 | 59．9879 | 1.0471 | 0646 | 0820 | 0995 | 1169 | 1344 | 1518 | 1693 | 1867 | 2042 | 60 |
| 61 | 9907 | 04 | 9901 | 98 | 9894 | 9891 | 88 | 9884 | 81 | 60＇987 | 6 | 0823 | 1001 | 117 |  | 153 | 171 | 1888 |  |  | ， |
| 62 | 99 |  | 99 | 989 | 9893 | 889 | 9886 | 9882 | 9879 | 61.9875 | 82 | 1001 | 1181 | 1361 | 1542 | 1722 | 1902 | 2083 | 263 |  | 62 |
| 63 | 9904 | 990 | 9898 | 98 | 9891 | 9887 | 9884 |  | 9877 | 62.9873 | 1.0995 | 1178 | 1361 | 1545 | 1728 | 1911 | 2094 | 22 | 2461 | 26 | 63 |
| 64 | 99 |  | 9896 | ， | 9889 | 86 | 9882 | 9878 | 9875 | 63．9871 | 1．1170 | 1356 | 1542 | 1728 | 1914 | 2100 | 2286 | 2473 | 259 |  | 64 |
| 65 | 990 |  | 9894 | 9891 | 9887 | 884 | 80 | 9877 | 9873 | 64.9869 | $1 \cdot 1344$ | 1533 | 1722 | 1911 | 2100 | 228 | 247 | 266 | 285 | 304 | 65 |
|  | 9899 | 9896 | 93 | 9889 | 88 | 882 | 9878 | 9875 | 9871 | 65．986 | $1 \cdot 1519$ | 1711 | 1903 | 2094 | 2286 | 2478 | 2670 | 2862 | 3054 | 3246 | 66 |
| 67 | 989 | 9895 | 9891 | 98 | 9884 | 9880 | 9877 | 9873 | 9869 | 66.9865 | 1.1693 | 188 | 2083 | 2278 | 2473 | 2667 | 2862 | 305 | 3252 |  | 67 |
| 68 |  |  |  |  | 9882 |  | 9875 | 1987 | 9867 | 67.9863 | 1786 | 2065 | 223 | 24， | 265 | 2656 | 3054 | 325 | 50 |  | 68 |
| 69 | 9895 | 9891 | 9888 | 9884 | 9880 | 9877 | 9873 | 9869 | 9865 | 68.9861 | $1 \cdot 2042$ | 2243 | 2444 | 2644 | 2845 | 3046 | 3246 | 3447 | 3648 | 3848 | 69 |
| 70 | 9893 | 9890 | 9886 | 9882 | 9879 | 9875 | 9871 | 9867 | 9863 | 69．9859 | 1.2217 | 2420 | 2624 | 2827 | 3031 | 3235 | 3438 | 3642 | 3845 | 404 | 70 |
| 71 | 9892 | 9888 | 9885 | 9881 | 9877 | 9873 |  | 9865 | 矿 | 70.98 | 12391 | 2598 | 2804 | 位 | 3217 | 3424 | 3630 |  | 201 |  | 71 |
| 72 | 9890 | 9887 | 9883 | 9879 | 9875 | 9871 | 9867 | 9863 | 9859 | $71 \cdot 985$ | 12566 | 2775 | 2985 | 3194 | 3403 | 3613 | 3822 | 4032 | 4241 | 445 | 72 |
| 73 | 9889 | 9885 | 9881 | 9877 | 9873 | 9870 | 9865 | 9861 | 9857 | $72 \cdot 9853$ | $1 \cdot 2740$ | 2953 | 3165 | 3377 | 3590 | 3802 | 4014 | 4226 | 4439 | 465 | 73 |
| 74 | 988 | 咗 | 983 | 9876 | 9872 |  | 9864 | 9859 | 9855 | 73．985 | $1 \cdot 2915$ | 3130 | 3345 | 3560 | 377 | 3991 | 4206 | 4421 | 4637 | 485 | 74 |
| 75 | 9886 | 9882 | 9878 | 9874 | 9870 | 366 | 9862 | 9858 | 9853 | 74．9849 | $1 \cdot 3089$ | 3307 | 3526 | 3744 | 3962 | 4180 | 439 | 4616 | 483 | 505 | 75 |
| 76 | 9884 | 80 | 9876 | 9872 | 9868 | 9864 | 9860 | 9856 | 9851 | 75．984 | $1 \cdot 3264$ | 3485 | 3706 | 3927 | 4148 | 4369 | 4590 | 4811 | 5032 | 525 | 76 |
| 77 | 9883 | 9879 | 9875 | 9871 | 9867 | 9862 | 9858 | 9854 | 9849 | 76.984 | $1 \cdot 3438$ | 3662 | 3886 | 4110 | 4334 | 4558 | 4782 | 5006 | 5230 | 545 | 77 |
| 78 | 9881 | 9877 | 9873 | 9869 | 9865 | 9861 | 9856 | 9852 | 9847 | 77.9843 | $1 \cdot 3613$ | 3840 | 4067 | 4293 | 4520 | 4747 | 4974 | 5201 | 5428 | 565 | 78 |
| 79 | 9880 | 9876 | 9872 | 9867 | 9863 | 9859 | 9854 | 9850 | 9845 | 78.9841 | $1 \cdot 3787$ | 4017 | 4247 | 4477 | 4706 | 4936 | 5166 | 5396 | 5625 | 585 | 79 |
| 80 | 9878 | 9874 | 9870 | 9866 | 9661 | 9857 | 9853 | 9848 | 9844 | 79.9839 | $1 \cdot 3962$ | 4195 | 4427 | 4660 | 4893 | 5125 | 5358 | 559 | 5823 | 659 | 80 |
| 81 | 9877 | 9873 | 9868 | 9864 | 9860 | 855 | 9851 | 9846 | 9842 | 0．983 | 4136 | 4372 | 4608 | 4843 | 5079 | 5314 | 5550 | 5786 | 6021 |  | 81 |
| 82 | 9875 | 9871 | 9867 | 9862 | 9858 | 9853 | 9849 | 9844 | 9840 | 81.9835 | 1.4311 | 4549 | 4788 | 5026 | 5265 | 5503 | 5742 | 5980 | 6219 | 645 | 82 |
| 83 | 9874 | 9869 | 9865 | 9861 | 9856 | 9852 | 9847 | 9842 | 9838 | 82.9833 | 1.4485 | 4727 | 4968 | 5210 | 5451 | 5692 | 5934 | 6175 | 6417 | 665 | 83 |
| 84 | 9872 | 9868 | 9863 | 9859 | 9854 | 9850 | 9845 | 9840 | 9836 | 83．983 | $1 \cdot 4660$ | 4904 | 5149 | 5393 | 5637 | 5882 | 6126 | 6370 | 6614 | 685 | 84 |
| 85 | 9871 | 9866 | 9862 | 985 | 9853 | 9848 | 9843 | 39 | 9834 | 982 | 1.4835 | 5082 | 5329 | 5576 | 5823 | 607 | 6318 | 656 | 6812 | 705 | 85 |
| 86 | 9869 | 9865 | 9860 | 9856 | 9851 | 9846 | 9842 | 9837 | 9832 | 85.9827 | 1.5009 | 5259 | 5509 | 5759 | 6010 | 6260 | 6510 | 6760 | 7010 | 726 | 86 |
| 87 | 9867 | 9863 | 9859 | 9854 | 9849 | 9845 | 9840 | 9835 | 9830 | 86.9825 | 1.5184 | 5437 | 5690 | 5943 | 6196 | 6449 | 6702 | 6955 |  | 46 | 87 |
| 88 | 9866 | 9861 | 9857 | 9852 | 9847 | 9843 | 9838 | 9833 | 9828 | 87.9823 | 1.5358 | 5614 | 5870 | 6136 | 6382 | 6638 | 6894 | 7150 | 7406 | 766 | 88 |
| 89 | 9864 | 9860 | 9855 | 9851 | 9846 | 9841 | 9836 | 9831 | 9826 | 88.9821 | 1.5533 | 5791 | 6050 | 6309 | 6568 | 6827 | 7086 | 7345 | 7603 | 786 | 89 |
| 90 | 9863 | 9858 | 9854 | 19849 | 44 | 9839 | 9834 | 9829 | 9824 | 89.9819 | 1.5707 | 5969 | 6231 | 6492 | 675 | 7016 | 7278 | 7539 | 780 | 806 | 90 |
| 91 | 9861 | 9857 | 9852 | 9847 | 9842 | 9837 | 9832 | 9827 | 9822 | 90.981 | $1 \cdot 5882$ | 6146 | 6411 | 6676 | 6940 | 7205 | 7470 | 7734 | 799 | 26 | 91 |
| 92 | 9860 | 9855 | 9850 | 9846 | 9841 | 9836 | 9830 | 9825 | 9820 | 91.9815 | 1.6056 | 6324 | 6591 | 6859 | 7127 | 7394 | 7662 | 7929 | 8197 | 846 | 92 |
| 93 | 9858 | 9854 | 9849 | 9844 | 9839 | 9834 | 9829 | 9823 | 9818 | 92.9813 | $1 \cdot 6231$ | 6501 | 6772 | 7042 | 7313 | 7583 | 7854 | 8124 | 8395 | 866 | 93 |
| 94 | 9857 | ¢852 | 9847 | 9842 | 9837 | 9832 | 9827 | 9821 | 9816 | 93.9811 | 1.6405 | 6679 | 6952 | 7225 | 7499 | 7772 | 8046 | 8319 | 8592 | 886 | 94 |
| 95 | 9855 | 9850 | 9846 | 9840 | 9835 | 9830 | 9825 | 9820 | 814 | 94.9809 | 1.6580 | 6856 | 7132 | 7409 | 7685 | 7961 | 8238 | 8514 | 8790 | 906 | 95 |
| 96 | 9854 | 9849 | 9844 | 9839 | 9834 | 9828 | 23 | 9818 | 9812 | 95.980 | 1．6754 | 7033 | 7313 | 7592 | 7871 | 8150 | 8430 | 8709 | 8988 |  | 96 |
| 97 | 9852 | 9847 | 9842 | 9837 | 832 | 9827 | 981 | 9816 | 981 | 96.9805 | 16929 | 7211 | 7493 | 7775 | 8057 | 8339 | 8621 | 8904 | 9186 | 46 | 97 |
| 98 | 985 | 9846 | 9841 | 9835 | 9830 | 9825 | 9819 | 9814 | 9808 | 97.9803 | 1.7103 | 7388 | 7673 | 7958 | 8243 | 8528 | 8813 | 9099 | 9384 | 966 |  |
| 99 | 9849 | 9844 | 9839 | 9834 | 9828 | 9823 | 9818 | 9812 | 9806 | 98.9801 | 17278 | 7566 | 7854 | 8142 | 8430 | 8718 | 9005 | 9293 | 9581 | 88 | 99 |
| 100 | 9848 | 9843 | 9837 | 9832 | 9827 | 9821 | 9816 | 9810 | 9804 | 99．9799 | $1 \cdot 7452$ | 7743 | 8034 | 8325 | 8616 | 8907 | 9197 | 9488 | 9779 | ＋070 | 100 |
|  | $60^{\prime}$ | $59^{\prime}$ | $58^{\prime}$ | $57^{\prime}$ | $56^{\prime}$ | $55^{\prime}$ | $54^{\prime}$ | $53^{\prime}$ | $52^{\prime}$ | $51^{\prime}$ | $60^{\prime}$ | 59 | 558 ${ }^{\prime}$ | 57 | $56^{\prime}$ | $55^{\prime}$ | $54^{\prime}$ | $53^{\prime}$ | $52^{\prime}$ | 5 |  |
|  |  |  |  |  | SIN |  |  |  |  |  |  |  |  |  | Cos | INE． |  |  |  |  | $88^{\circ}$ |

TRAVERSE TABLES．

| 1 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ |  | $12^{\prime}$ | 13＇ |  | $15^{\prime}$ | 16 | $17^{\prime}$ | 18 | 19 | $10^{\prime}$ | $11^{\prime}$ | $12^{\prime}$ | 13 | $14^{\prime}$ | ， | $16^{\prime}$ |  |  |  |  |
|  | 9998 | 19998 | 9998 | 9998 | 9998 | 19998 | 9998 | 9997 | 1999 | －9997 | ${ }^{0204}$ | 0207 | 0209 | 0212 | 0215 | 0218 | 0221 | 0224 | 0227 | 0230 |  |
|  | 9996 | 9996 | 9996 | 9995 | 9995 | 9995 | 9995 | 5 | 9995 | 1.9995 | 0407 | 0413 | 0419 | 25 | 0430 | 0436 | 0442 | 0448 | 0454 | 0460 |  |
|  | 39994 | 99 | 9993 | 9993 | 9993 | 9993 | 9993 |  | 998 | 2.9992 | 0611 | 06 | 0628 | 063 | 06 | 0654 | 0663 | 0672 |  | 0689 |  |
|  | 9990 | 99 |  | 993 | 9991 9988 | 9990 9988 | 9990 | 87 | 9987 |  | 0814 | 0826 1033 | 104 | O849 | 08 | 0873 1091 | 0884 | 0896 1120 |  |  |  |
|  | 9990 |  |  |  | 9988 | 19988 | 885 | 87 | 9987 |  |  |  | $11257$ | 1062 | 129 |  | 1105 | 1120 | ${ }^{1361}$ |  | $\frac{5}{6}$ |
|  | 79985 | 99 |  |  | 9984 |  | 9983 | 9982 | 998 |  | 1425 | 1446 |  |  |  | 152 |  | 15 |  | 160 | 7 |
|  | 9983 |  | 9982 | 9982 | 998 | 9981 | 9980 |  | 907 | 7.99 | $\cdot 1629$ | 1652 | 1675 | 1699 | 1722 | 1745 | 1768 | 1792 | 1815 | 183 |  |
|  | 9981 | 9981 | 9980 | 99 | 9979 | 9979 | 9978 | 77 | 9977 | 8.9976 | 1832 | 1859 | 1885 | 1911 | 1937 | 1963 | 1990 | 2016 | 2042 | 2068 |  |
|  | 9979 | 9979 | 9818 | 997 | 9977 | 9976 | 9976 | 9975 | 9974 | 9．9974 | 2036 | 2065 | 2094 | 2123 | 2152 | 2181 | 2211 | 2240 | 2269 | 2298 | 0 |
|  | 119977 | 1997 | 9976 | 9975 | 19975 | 19974 | $\left.\right\|^{9973}$ | 9972 | 9972 | 10．9971 | 2240 | 2272 | 2304 | 2336 | 2368 | 2400 | 2432 | 2464 | 2496 | 2528 | 11 |
|  | 129975 | 9974 | 9974 | 9973 | 9972 | 9971 | 9971 | 9970 | 9969 | 11.9968 | 2443 | 2478 | 2513 | 2548 | 2583 | 2618 | 2653 | 2688 | 2722 | 275 | 12 |
|  | 9973 | 997 | 99 | 99 | 997 | 9969 | 99 | 9967 | 9967 | 12.9966 | 2647 | 2685 | 2723 | 276 | 27 | 2836 | 2874 | 2912 | 2949 | 2 | 13 |
|  | 971 | 997 | 99 | 99 | 99 | 99 |  | 9965 | 9964 | 13.9 | 285 | 2891 | 2932 | 2973 | 301 | 3054 | 3095 | 3136 | 3176 | 32 | 14 |
|  | 15996 | 996 | 9967 | 9966 | 9 | 99 | 9 | 99 | 9961 | 14.99 | －3054 | 3098 | 314 | 3185 | 32 | 327 | 3316 | 33 | 03 | 3447 |  |
|  | 169967 | 996 | 9965 | 9964 | 19 | 9962 | 99 | 9960 | 9959 | 15.99 | －3258 | 33 | 33 | 33 | 34 | 34 |  | 35 |  |  | 6 |
|  | 9965 | 98 |  |  | 9961 |  |  | 909 |  |  |  | 371 |  | 3610 | 3659 | 3709 | 375 |  | 385 |  | 17 |
|  | 996 | 9962 |  | 9959 | 9958 | 995 | 9956 | 55 | 9954 | 17.995 | 3665 | 3717 | 3770 | 3822 | 3874 | 3927 | 3979 | 4031 | 4084 | 413 | 18 |
|  | 9961 | 9959 | 9958 | 9957 | 995 | 9955 | 9954 | 9952 | 9951 | 18.9950 | 3869 | 3924 | 3979 | 4034 | 4090 | 4145 | 4200 | 4255 | 4311 | 436 | 19 |
|  | 20.9959 | 9957 | 9956 | 9955 | 9954 | 9952 | 9951 | 9950 | 9949 | 19.9947 | 4072 | 4130 | 4188 | 4247 | 4305 | 4363 | 4421 | 4479 | 4537 | 4596 | 20 |
|  | 9956 | 9955 | 9954 | 9953 | 9951 | 9950 | 9949 | 9947 | 9946 | 20．9945 | 4276 | 4337 | 4398 | 4459 | 4520 | 4581 | 4642 | 4703 | 4764 | 48 | 21 |
|  | 9954 | 9953 | 99 | 99 | 9949 | 9948 | 9946 | 9945 | 9943 | 21.9942 | 4479 | 4543 | 4607 | 4671 | 4735 | 4799 | 4863 | 4927 | 4991 |  | 22 |
|  | 239952 | 995 | 9950 | 99 | 99 | 9 | 9944 | 9942 | 9941 | $22^{2} \cdot 9939$ | 4683 | 4750 | 4817 | 4884 | 4951 | 5017 | 5084 | 5151 | 52 |  | 23 |
|  |  | 99 | 9947 |  | 99 | 99 | 99 | 9940 | 9938 | $23 \cdot 99$ | －4887 | 4956 | 50 | 50 | 51 | 5236 | 53 | 53 | 54 |  | 24 |
|  | 25.994 | 9947 | 9945 | 9944 | 9942 | 9941 | 993 | 9937 | 9936 | 24．993 | ． 5090 | 5163 | 5236 | 5398 | 538 | 5454 | 55 | 559 | 567 | 5745 | 25 |
|  | 269946 | 994 | 9943 | 9941 | 99 | 9938 | 9936 | 9935 | 9933 | $25^{\circ} 99$ | 5294 | 53 | 5445 | 5521 | 559 | 5672 | 57 | 58 |  |  | 26 |
| 27 | 279944 | 99 | 9941 |  | 9937 |  | 9934 | 9932 | 9931 |  |  | 5576 |  | 5733 | 5812 |  |  |  |  |  | 27 |
|  | 994 |  |  |  | 993 |  |  |  | 928 |  | 5701 | 57 | 58 | 5945 | 6027 | 6108 | 6190 | 627 | 6352 |  | 28 |
|  | 299994 | 9938 9936 | 9934 | 9932 | 9933 | 9931 9929 | 9927 | 9927 | 9925 | 28.9923 29.9921 | .5905 .6108 | 6195 | $6{ }_{6283}^{6073}$ | 6158 6370 | ${ }_{6457}^{6242}$ | ${ }_{6544}^{6326}$ | 6411 | 64895 | 6806 | 6893 | 29 30 |
| 31 | 319936 | 9934 | 9932 | 9930 | 19928 | 9926 | 9924 | ｜9922 | 9920 | $30^{\circ}$ | 6312 | 6402 | 649 | 658 | 6672 | 6763 | 6853 | 69 | 70 |  | 31 |
| $32$ | 329934 | 9932 | 99 | 99 |  | 9924 | 22 |  | 9918 | 31.991 | 6515 | 6609 | 6702 | 6795 | 6888 | 6981 |  | 716 | 72 |  |  |
|  | 339932 | 993 |  | 99 | 99 |  |  | 99 | 9915 | 32.9913 | 6719 | 6815 | 6911 | 7007 | 7103 | 719 | 7295 | 739 | 748 |  | 33 |
|  |  |  |  | 9923 | 9921 | 9919 | 9917 | 9915 | 9912 | 33.9 | 6223 | 7022 | 712 | 7219 | 73 | 741 | 7516 | 76 | 77 |  | 34 |
|  | 35 | 9925 | 923 |  | 9919 | 9917 | 9914 | 9912 | 99 | 34．9 | 7126 | 72 | 733 | 7432 | 75 | 763 | 7737 | 7839 | 7941 | 8042 | 35 |
|  | 369925 | 992 | 9921 | 9919 | 99 | 9914 | 9912 | 9910 | 9907 | 35 | 仡 | 74 |  | 758 | 774 | 7 | 隹 | 80 | 7 |  | 36 |
| 37 | 379923 | 99 | 99 | 9917 | 991 |  | 9910 | 9907 | 9905 | 36 | 7533 | 76 | 77 |  | 796 | 8072 | 8179 | 828 | 824 |  | 37 |
|  |  |  |  |  |  |  |  |  |  |  | 77931 | 78 |  | 8069 | 8179 |  |  |  |  |  | 38 |
|  | 40991 | 9917 | 9912 | 9910 | 9910 | 9905 | 9902 | 9902 | 9897 | 38．9897 | 814 | 82 | 8168 8377 | $\begin{aligned} & 8281 \\ & 8493 \\ & 843 \end{aligned}$ | 8394 8610 | 8726 | $\begin{aligned} & 8621 \\ & 8842 \end{aligned}$ | $\begin{array}{\|l\|} 875 \\ 8959 \end{array}$ | $\begin{aligned} & 8848 \\ & 9075 \\ & \hline \end{aligned}$ |  | 39 <br> 40 |
| 41 | 9915 | 9913 | 9910 | 9908 | 9905 | 9902 | 19900 | 9897 | 9894 | 40.989 | 8348 | 8467 | 8586 | 8706 | 8825 | 8944 | 9063 | 9183 | 9302 |  |  |
| $42$ |  | 9910 | 99 | 9905 | 9903 | 9900 | 9897 | 9895 | 9892 | 41.988 | 552 | 8674 | 8796 | 8918 | 40 | 9162 | 928 |  | 9529 |  |  |
| $43$ | 439911 | 998 |  | 99 | 9900 | 98 | 9895 | 9892 |  | 42.988 | 8755 | 8880 | 9005 | 9130 | 9255 | 9380 | 950 | 96 | 97 |  | 43 |
|  |  |  |  |  | 98 | 9895 | 98 | 989 | 9887 | 43. |  |  | 921 | 93 | 947 | 95 | 972 | 985 | 99 | ${ }^{1} 1$ | 44 |
|  | 459907 | 990 | 9901 | 98 | 9896 | 9893 | 9890 | 9887 | 9884 | 44 | 9 | 9293 | 9424 | 95 | 968 | 981 | 9948 | ＊078 | 0209 |  | 45 |
|  | 469905 | 99 | 9899 |  | 98 | 9891 | 9888 | 9885 | 9882 | 45 | 9366 | 9500 | 963 | 976 | 990 | 103 | 0169 |  | 0436 |  |  |
|  | 研 |  |  | 98 | 98 |  | 9885 | 98 | 9879 | 46 | 9570 | 9706 | 984 | 998 | ＋116 | 0233 | 0390 | 0526 | 06 |  | 47 |
| 48 | 489900 | 989 | 98 |  | 98 | 9886 | 9883 | 9880 | 9876 | 47．9873 |  | 99 | ＋052 | 0192 | 0332 | 0471 | 0611 |  |  | 1029 | 48 |
|  | 499898 | 9895 | 9893 |  |  |  |  | 9877 | 9874 | 48.9871 | 977 | ＋119 | 262 | 0404 |  | 0689 | 0832 | 0974 | 111 |  | 49 |
|  | 9896 | 9893 | 9890 | 9887 | 9884 | 9881 | 98.8 | 9875 | 9871 | 49．9868 | 1.0180 | 0326 | 0471 | 0617 | 0762 | 0907 | 1053 | 1198 | 1344 | 148 |  |
| 51 | 9894 | 9891 | 9888 | 9885 | ${ }^{9882}$ | 9879 | ${ }^{9875}$ | ${ }^{9872}$ | 9869 | 50．9865 | 1．0384 | ${ }^{0532}$ | 068 | ${ }^{082}$ | 0977 | ${ }^{132}$ | 1274 | ${ }^{1422}$ | ${ }_{1781}^{1797}$ | 17 |  |
|  |  | 9889 | 9886 | 9883 | 9880 | 9876 | 9873 | 9870 | 9866 | 51.9863 | 0588 | 0739 | 08 | 1041 | 1193 | 134 | 1495 | 1646 | 1797 | 1949 |  |
| $53$ |  | 988 | 98 | 98 | 9877 | 9874 | 9870 | 9867 | 9864 | 52.986 | $1 \cdot 0791$ | 0945 | 109 | 1254 | 1408 | 1562 | 1716 | 1870 | 2024 | 217 | 53 |
|  | 54.9888 | 9885 | 9882 | 9878 | 987 |  |  |  | 9861 |  |  | 11 | 13 | 1466 | 162 | 178 | 1937 | 2094 | 22 | 12 | 54 |
| 55 | 988 | 988 | 98 | 987 | 9873 | 9869 | 9866 | 9862 | 9858 | 54.9 | 11198 | 135 | 15 | 1678 | 183 | 19 | 215 | 23 | 2478 |  |  |
| 56 | 569884 | 988 | 987 | 987 | 9870 | 98 | 98 | 98 | 9856 | 55.98 |  |  | 172 | 189 | 205 | 2216 | 237 | 25 | 270 | 28 | 56 |
| 57 | 988 | 987 | 9875 | 9871 | 9868 | 98 | 98 | 9857 | 9853 |  | 1.1606 | 1771 | 1937 | 2103 | 22 | 2434 |  |  | 2932 |  |  |
|  | 589880 | 987 | 9873 | 98 | 986 | 9862 | 9858 | 9855 | 9851 | 57．98 | $1 \cdot 180$ | 1978 | 2147 | 2315 | 248 | 2653 | 2821 | 2990 | 3159 | 332 | 58 |
|  | 599878 |  |  |  |  |  | S56 | 9852 | 848 |  |  |  |  |  |  |  |  |  |  |  | 59 |
|  | 9876 | －8 | 986 | － |  |  | 9853 | 9850 | 846 | 59．984 | 1．2216 | 23 | 2565 | 2740 | 2914 | 3089 | 326 | 3438 |  |  |  |
| ${ }_{6}^{6}$ | 9874 | 9870 | 9866 | 9862 | 9859 | 9855 | 9851 | 9847 | 9843 |  | 12420 | 25 | 2775 | 2952 | 313 |  |  |  |  |  |  |
| 6 | 987 | 986 | 9864 | 9860 | 9856 | 9852 | 98 | 9845 | 9840 | 61.983 | $1 \cdot 2624$ | 28 | 2984 | 65 | 33 | 3525 | 37 | 38 |  | 42 | ${ }^{62}$ |
|  | 63986 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4110 | 4293 |  | 63 |
|  | 54 <br> 65 <br> 54 <br> 9865 | 988 | 98 | $\begin{array}{\|l\|l\|} \hline 98! \\ 98! \end{array}$ | $9852$ | $\left.\right\|_{98} ^{98}$ | 98 | 9839 | 9835 | 63 | $1 \cdot 3$ | $3217$ | 3403 |  | $3775$ | 3962 4180 | 4148 |  |  |  | 64 65 |
|  | 669863 |  | 98 | 98 | 9847 | 9843 | 9839 | ｜9834 | 9830 | 65．982 |  |  |  |  |  |  |  |  |  |  |  |
|  | 981 |  | 98 | 98 | 9845 | 984 | 9836 | 9832 | 9828 | $66 \cdot 9$ | $1 \cdot 36$ | 3837 | 403 | 4226 | 4421 | 4616 | 4811 | 06 | 5200 | 53 | 67 |
|  | 98 | 9855 | 98 | 98 | 9842 | 98 | 9834 |  | 9825 | 67．98 | 1.3845 | 4043 | 4241 | 4439 | 4636 | 4834 | 5032 | 5230 | 5427 | 5625 | 68 |
|  | 699857 |  |  |  |  |  | 9831 | 27 |  | 68.9818 | 保 | 4250 | 4450 | 4651 | 4852 | 5052 | 5253 | 5454 | 5654 | 585 | 69 |
|  | 709855 | 9851 | 9846 | 9842 | 9838 | 9833 | 9829 | 9824 | 9820 | 69.9815 | 1.4253 | 4456 | 4660 | 4863 | 5067 | 5270 | 5474 | 5678 | 5881 | 6085 | 70 |
|  | 719853 | 9849 | 9844 | 9840 | 19835 | 9831 | 19826 | 9822 | 9817 | 70．9813 | 1.4456 | 4663 | 14869 | 5076 | 5282 | 5489 | 5695 | 5902 | 6108 |  | 7 |
|  | 矿 | 984 | 98 | 98 | 98 | 98 | 98 | 9819 | 9815 | 71.981 | $1 \cdot 46$ | 48 | 5079 | 5288 | 5497 | 5707 | 59 | 61 | 5 |  | 72 |
|  | 73984 |  |  |  |  |  |  |  |  |  |  |  |  |  | 5713 | 59 | 613 |  |  |  | 73 |
|  | ${ }_{75} 799884$ | 9842 984 | 9836 | 9833 9831 | 9829 | ${ }_{9822}^{9824}$ | 9819 | 9814 | 9810 9807 | 73.9805 74.9802 | 1．5067 | $5282$ | $5497$ | $5713$ | 5159 | $\left.\right\|_{63} ^{614}$ | $6358$ | 6573 | ${ }_{7015}^{6789}$ |  | 74 75 7 |
|  | 76984 | 9838 | 9833 | 9829 | 19824 | 9819 | 19814 |  | 9804 | $75 \cdot 979$ | 1.5474 |  |  |  |  |  |  |  |  |  |  |
|  | 98 | 9836 | 9831 | 9826 | 9822 | 9817 | 9812 | 98 | 9802 | 76．979 | $1-5678$ | 5902 | 6126 | 6350 | 6574 | 6797 | 7021 | 72 |  |  | 77 |
|  | 7898388 | 98 | 9829 | 98 | 98 | 9814 |  |  |  | 77.979 | 1.5881 | 6108 | 6s | 2 | 6789 | 7016 | 42 | 7469 | 7792 | 7923 | 78 |
|  | 79.9836 |  |  |  |  |  |  |  |  | 78.979 | 1.6085 | 6315 | 6544 | 6774 | 枹 | 7234 | 7464 | 7693 | 7923 | 8153 | 79 |
|  | 80.9834 | 9829 | 9825 | 9820 | 9815 | 9810 | 9804 | 9799 | 9794 | 79.9789 | 1.6289 | 6521 | 6754 | 6987 | 7219 | 7452 | 7685 | 7917 | 8150 | 8382 | 80 |
|  | 9832 | 9827 | 9822 | 98 | 9812 | 9807 | 9802 | 797 | 9792 | 80.9786 | 1.6492 | 6728 | 6963 | 7199 | 7435 | \％ | 7906 | 8141 | 7 | ${ }^{8612}$ |  |
|  | 9830 | 98 | 98 | 981 | 981 | 98 | 9800 | 9794 | 9789 | 81.9784 | $1 \cdot 669$ | 6934 | 7173 | 7411 | 76.5 | 7888 | 8127 | 8365 | 4 | 8842 | 82 |
|  | 9828 | 9823 | 98 | 981 | 980 | 980 | 9797 | 9792 | 9786 | 82.978 | 168 | 714 | ．738 | 7624 | 786 | 8106 | 83 | 85 | 8830 | 9072 | 83 |
|  | 84 85 8582826 | 9821 |  | 9811 |  | 978 | 9792 | 9789 | 978 | 83.97 | $1 \cdot 71$ | 7347 | 7592 | 7836 | 8080 | 832 | 85 |  |  |  | 84 |
|  | 8698 |  | 98 |  | 9801 | 19798 | 9792 | 19787 | 9781 | 84 | 17307 | 7554 | 7801 | 802 | 8295 | 8543 | 879 | 933 | 19284 |  | 85 |
|  | 87982 | 9814 | 9809 | 硡 | 9798 | 9793 | 9787 | 9782 | 9776 | 86.973 | $1 \cdot 77$ | 7967 | 8220 | 8473 | 872 | 897 | 9232 | 948 | 97 |  | 86 87 |
|  | 88 | 9812 |  |  | 9796 | 9791 |  |  |  | 87.9 | 17918 | 8173 | 8429 | 8685 | 89 |  | 94 |  |  | 1221 | 88 |
|  | ${ }^{89} 99816$ | 9810 | 9805 |  | 9794 | 9788 | 9782 |  | 776 | 88．9765 | $1 \cdot 8121$ | 8380 | 8639 | 8898 | 2156 | 9415 | 9674 | 9933 | －191 | 0451 | 89 |
|  | ${ }^{90} 9813$ | 9808 | 9803 | 9797 | 9791 | 9786 | 9780 | 9774 | 9768 | 89．9762 | $1 \cdot 8325$ | 8586 | 8848 | 9110 | 9372 | 633 | 895 | ＋157 | 04 | 0680 |  |
|  | 9809 | ${ }^{9806}$ | 9800 | 9795 | 9789 | 9783 | 9778 | 9772 | 9766 | 90．980 | 1.8528 | 87 | 90 | 9322 | 9587 | 98 | ．116 | 0381 | 0645 |  |  |
|  | 92983 |  | 9796 | 9790 | 9785 |  |  |  |  |  |  |  |  |  | 880 | －070 |  | 0605 |  |  | 92 |
|  | 949805 |  |  | 9788 | 82 | 9776 | 9770 |  | 975 | 93．975 | 1.913 | 9413 | 94 | 995 | －23 | 050 | 0578 | 1025 | ${ }_{1}$ |  | 94 |
|  | 959803 | 9797 | 9792 | 9786 | 9780 | 9774 | 9768 | 9762 | 9755 | 94．9749 | 1.9343 | 961 | 9895 | ${ }_{172}$ | 0448 | 0724 | 1000 | 1277 | 1553 | 1829 | 94 |
|  | 98 | 9795 | 9789 | 9784 | 9778 | 9772 | 9765 | 9759 | 9753 | 95：974 | 1.9546 |  |  | 0384 | 0663 |  |  | 1501 | 1780 |  | 96 |
|  | 9799 | 9793 | 978 | 9781 | 9775 | 9769 | 97 | 9757 | 9750 | 96：974 | 1.975 | －032 | 0314 | 0596 | 0878 | 1160 | 1443 | 172 | 200 | 228 |  |
|  |  |  |  |  |  |  |  | 975 | 7748 | 97．974 | 1.9954 | －239 | 0524 | 0809 | 10 | 1379 | 16 | 1949 | 223 | 2519 | 98 |
|  | 9793 | 9787 | 9781 | 9775 | 9768 | 9762 | 9756 | 974 | 9774 | 988．9739 | 2.0157 2.0361 | 0445 | 0943 | 1021 <br> 1233 | 1524 | 1897 | 2106 | $1 \begin{aligned} & 2173 \\ & 2397\end{aligned}$ | 2687 | 2978 | 190 |
|  | $50^{\circ}$ | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | $46^{\prime}$ | $45^{\prime}$ | $44^{\prime}$ | $43^{\prime}$ | $42^{\prime}$ | $41^{\prime}$ | ${ }^{50}$ | $49^{\prime}$ | 48＇ | 23 | $46^{\prime}$ | $45^{\prime}$ | $44^{\prime}$ | 硣 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | IN |  |  |  |  |  |

TRAVERSE TABLES.


9

TRAVERSE TABLES．

| $1{ }^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sinf． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 30 | $3{ }^{\prime}$ | 32 | 33＇ | 34 | 1 $35^{\prime}$ | $36^{\prime}$ | 37 | $38^{\prime}$ | $39^{\prime}$ | $30^{\prime}$ | 31 | $32^{\prime}$ | 3，3 | $34^{\prime}$ | 35＇ | $36^{\prime}$ | 37 | $38^{\prime}$ | 39 |  |
|  | 99 | 9996 | 99 | 9996 | 9996 | 9996 | 9996 | 9996 | 9996 | 996 | 0262 | 65 | 0268 | 0270 | 273 | 0276 | 02 | 0282 | 0285 | 0288 |  |
|  | 99 | 9993 | 999 | 99 | 帾 | 9992 | 99 | 99 | 99 | ． 9 | 0524 | 052 | 0535 | 0541 | 0547 | 05 | 0558 |  | 0570 | 0576 |  |
|  | 99 | 9989 | 9989 | 99 | 9989 | 9989 | 9988 | 98 | 9988 | 2.9 | 0785 | 0794 | 08 | 0811 | 0820 | 082 | 0838 | 0846 | 0855 | 08 |  |
|  | 998 | 9986 | 9986 | 99 | 9985 | 9985 | 9984 | 84 | 9984 | 3.9983 | 1037 | 105 | 1070 | 1082 | 1094 | 110 | 11 | 112 | 140 | 1152 |  |
| 5 | 9983 | 9982 | 9982 | 998 |  | 9981 | 998 |  | 9980 | 4.9979 | 1309 | 1323 | 1338 | 1352 | 1367 | 1382 | 1396 | 1411 | 1425 | 1440 |  |
| 6 | 9979 | 9979 | 9979 | 9978 | 997 | 997 | 9977 | 9976 | 9976 | 5.9975 | 1571 | 1588 | 1606 | 1623 | 16 | 16 | 1675 | 1693 | 10 | 1728 |  |
|  | 99 | 997 |  | 99 |  | 析 | 9973 | 9972 | 9972 |  | 832 | 185 | 18 | 1893 | 19 | 1934 | 1955 | 1975 | 595 | 2016 |  |
|  | 9973 | 9972 | 997 | 99 | 9970 | 9969 | 99 | 9968 | 9967 |  | 209 | 2117 | 21 | 2164 | 2187 | 2210 | 2234 | 2257 | 2280 | 230 |  |
|  | 99 | 9968 | 99 |  |  |  |  | 9 | 996 | 8.9 | 235 | 238 | 2408 | 2434 | 2461 | 2487 | 2513 | 2539 | 2565 |  |  |
| 10 | 9966 | 9965 |  |  |  |  | 9961 | 9960 | 995 | 9.9959 | 2618 | 2647 | 676 | 2705 | 2734 | 2763 | 279 | 2821 | 2850 | 2879 | 10 |
| 11 | 99 | 9961 | 9961 | 9960 | 9959 | 9958 | 9957 | 9956 | 9955 | 10 | 879 | 29 | 2943 | 2975 | 3007 | 3039 | 3071 | 3103 | 3135 | 316 | 11 |
| 12 | 99 | 995 | 9957 | 995 | 9955 | 9954 | 9953 | 9 | 995 |  | 1 | 317 | 32 | 32 | 32 | 3316 | 3351 | 3385 |  |  | 2 |
| 13 | 99 | 99 | 99 |  |  |  | 9949 | 9948 | 99 | 12.99 | 403 | 3441 | 3479 | 3516 | 3554 | 3592 | 363 |  |  | 3743 | 13 |
| 14 | 9952 | 995 | 9950 | 99 | 9948 | 9947 | 99 | 99 | 9943 | 13. | 665 | 3705 | 37 | 37 | 3828 | 386 | 39 | 3 | 3990 | 4031 | 14 |
| 15 | 99 | 994 |  | 9945 | 9944 | 9943 | 9942 | 40 | 9939 | 14.9 | 927 | 3970 | 401 | 405 | 4101 | 4145 | 418 | 423 | 4275 | 4319 | 15 |
| 16 | 99 | 9944 |  |  |  |  |  |  |  | 15 ＇993 |  | 4235 | 428 |  |  | 4421 | 4467 |  |  |  | 16 |
| 17 | 99 |  |  |  |  |  |  | 9932 |  |  |  | 450 |  |  |  | 469 | 4747 |  |  |  | 7 |
| 18 | 993 | 9937 | 99 | 9934 | 9933 |  | 9930 | 9928 | 992 | 17.992 | 712 | 476 | 4817 | 48 | 49 | 4974 | 502 | 5078 | 5131 | 518 | 8 |
| 19 | 9935 | 99 |  |  |  |  | 26 | 9924 | 992 | 18.9921 | 974 | 5029 | 50 | 5139 | 5195 | 5250 | 53 | 5360 | 5416 |  | 19 |
| 20 | 9931 | 9930 |  | 9927 | 25 | 24 | 22 | 20 | 9919 | 19.9917 | 5235 | 529 | 535 | 5410 | 5468 | 52 | 55 | 5642 | 570 | 5759 | 20 |
| 21 | 992 | 9926 | 9925 | 9923 | 9922 | 9920 | 9918 | 9916 | 991 | 20.991 | 49 | 555 | 5619 | 5680 | 5741 | 5802 | 5864 | 5925 | 5986 | 6047 | 21 |
| 22 | 99 | 9923 |  |  |  |  | 9914 | 9912 | 991 |  | 75 | 58 |  |  |  | 6079 | 61 |  |  |  | 22 |
| 23 | 99 |  |  |  |  |  |  |  |  |  |  |  |  |  | 6288 | 6355 | 6422 |  |  |  | 23 |
| 24 | 9918 | 9916 | 9914 | 991 | 9910 |  | 9906 | 9904 | 9902 | 23.990 | 28 | 63. | 6422 | 64 | 6562 | 663 | 67 | 6771 | 684 |  | 24 |
| 25 | 9914 |  |  |  |  |  | 9903 |  | 9898 | 24.9896 |  |  |  | 6762 | 6835 | 690 | 69 | 7053 | 7126 | 7199 | 25 |
| 26 | 99 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 99 |  |  |  |  |  |  | 9893 |  | $26 \cdot 9$ |  | 71 | 72 |  |  | 746 | 7539 |  |  |  | 27 |
| 28 | 99 | 9902 | 9900 | 989 |  |  |  |  |  |  |  |  |  |  |  | 773 | 78 | 789 |  |  | 28 |
| 29 | 99 | 983 |  |  |  | 9889 | 析 | 88 | 9882 | 87 |  |  |  |  | 929 | 801 | 809 | 818 | 826 |  | 29 |
| 30 | 9897 | 9895 | 9893 | 9890 | 9888 | 9885 | 9883 | 881 | 878 | 87 | 7853 | 7940 | 8028 | 81 | 8202 | 828 | 837 | 846 | 855 | 8638 | 30 |
| 31 | 989 | 9891 | 9889 | 9887 | 9884 | 9882 | 9879 | 9877 | 987 | 30.987 | 115 | 820 | 8295 | 83 | 8475 | 8566 | 8656 | 8746 | 8836 | 8926 |  |
| 32 | 98 | 9888 |  |  |  |  | 9875 | 9873 |  |  |  |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 98 | 988 | 9882 |  |  |  | 987 | 9869 | 9866 | 32.986 | 63 |  |  |  |  | 911 | 92 | 931 | 940 |  | 33 |
| 34 | 98 | 98 | 98 | 9876 | 9873 | 9870 |  | 9865 |  |  |  |  |  | 9197 | 9296 | 9395 | 9493 | 9592 |  |  | 34 |
| 35 | 9880 | 9877 | 9875 | 9872 |  |  |  |  | 9858 | 34．9855 |  |  |  |  |  | 9671 | 9773 |  |  |  | 35 |
| 36 | 987 | 9874 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 052 |  |  |  | 36 |
| 37 | 987 | 9870 | ， |  | 9862 | 9859 |  |  |  |  |  |  |  |  |  | 0223 | 0331 |  |  |  | 37 |
| 38 | 987 | 88 | 98 | 986 |  | 9855 | 9852 | 9849 | 9846 | 37.984 | 947 |  |  |  | 0389 | 05 | 06 |  |  |  | 38 |
| 39 | 9866 | 63 | 9860 | 9857 |  | 9851 |  |  | 9842 |  | 20 |  |  |  | 066 | 077 | 088 |  |  |  | 39 |
| 40 | 9863 | 9860 | 9857 | 985 | 9850 | 984 | 98 | 析 | 9837 | 39.983 | 1.0471 | 058 | 07 | 08 | 093 | 105 | 11 | 12 | 1401 | 15 | 40 |
| 41 | 98 | 9856 | 9853 | 9850 |  | 9843 | 9840 | 9837 | 9833 |  | $1 \cdot 0733$ | 085 |  |  |  | 1329 | 1448 |  |  |  |  |
| 42 | 98 | 9853 |  |  |  |  |  | 9833 | 9829 |  | 9 |  |  |  | 1483 | 1605 |  |  |  |  | 42 |
| 43 | 985 | 9849 | 98 | 9843 | 9839 | 9836 | 9832 |  | 982 | 42.982 | － 125 | 13 | 15 |  | 17 | 188 | 20 | 21 | 2256 |  | 43 |
| 44 | 98 | 9846 | 9842 | 983 |  |  |  | 9825 | 9821 |  |  |  |  | 19 |  | 215 |  |  |  |  | 44 |
| 45 | 9846 | 9842 | 9839 | 9835 | 9832 | 9828 |  | 9821 | 9817 | 44．9813 | 178 |  |  | 2172 | 2303 |  |  |  |  |  | 45 |
| 46 | 9842 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 983 |  | 9832 |  |  |  |  |  |  |  |  |  |  |  |  | 2987 |  |  |  |  |  |
| 48 | 983 | 9832 | 9828 | 9824 |  | 9817 | 9813 | 9809 | 98 | 47.980 | 1.256 |  | 2844 | 2984 | 3123 | 32 | 34 |  |  | 82 | 48 |
| 49 | 9832 | 9828 | 9825 |  | 9817 | 13 | 9809 | 85 | 9801 | $48^{\circ} 979$ | 研 |  | 31 | 32 | 33 | 353 | 36 | 38 |  | 410 | 49 |
| 50 | 9829 | 9825 | 9821 | 9817 |  | 980 | 980 | 980 | 9797 | 49．9793 | 308 | 323 | 33 | 35 | 367 | 381 | 396 | 1 | 4252 | 43 | 50 |
| 51 | 98 | 9821 | 9817 | 9813 |  |  |  |  |  |  | 1.335 |  |  |  |  | 4092 | 4240 |  |  |  |  |
| 52 | 98 |  |  |  |  |  |  |  |  | 51.978 | 36 |  |  | 406 | 4217 | 4368 | 451 |  |  |  | 52 |
| 53 | 98 | 9814 | 9810 | 9806 | 9802 | 979 | 9793 |  | 97 | 2．9 | 18 |  |  |  |  | 46 |  |  |  |  | 53 |
| 54 | 98 | 9811 |  | 9802 |  |  |  |  |  | 53.977 | $1 \cdot 41$ |  | 445 |  | 47 | 492 | 50 | 5235 | 5392 |  | 54 |
| 55 | 9812 | 9807 | 9803 | 9799 | 9794 | 9790 | 9786 | 9781 | 9777 | 54．9772 | 1－439 | 455 | 4717 | 4877 | 5037 | 5197 | 5357 | 55 | 567 | 583 | 55 |
| 56 | 98 | 9804 |  |  |  | 9786 |  |  |  |  |  |  |  |  | 5310 | 5473 |  |  |  |  | 56 |
| 57 | 98 |  | 97 |  |  |  |  |  |  | 56 |  |  |  |  |  | 5750 | 59 |  |  |  |  |
| 58 |  |  |  |  |  |  |  |  | 9764 | 5．976 | 1.51 |  |  |  | 5857 | 6026 | 6195 | 636 |  | 670 | 58 |
| 59 | 9798 | 9793 | 97 | 97 | 9779 | 9775 | 770 | 976 | 97 | 58.97 | 5 | 56 |  |  | 61 | 63 | 647 | 66 | 68 |  | 59 |
| 60 | 9794 | 9790 | 9785 | 9780 | 9776 | 9771 | 766 | 9761 | 9756 | 59.975 | 1.5706 | 588 | 6055 | 6230 | 6404 | 6579 | 6753 | 6927 | 7102 | 727 | 60 |
|  |  |  |  |  |  | 9767 |  |  |  |  | 1.5968 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 162 |  |  | 6771 | 695 | 仿 |  | 749 | ， | 785 | 62 |
| 6 | 97 | 97 | 97 | 9769 |  | 97 | 9754 | 97 |  | 62.973 | ． 64 |  |  | 70 | 72 | 740 | 759 |  |  |  |  |
| 64 |  |  |  |  |  |  |  |  |  | 63＇973 | ． 675 |  |  | 12 |  | 768 |  |  | 8242 | 842 | 64 |
| 65 | 97 | 9772 | 9767 |  | 9757 |  |  |  |  | 64.973 | 701 | 720 | 73 | 7582 | 777 | 796 | 81 | 833 | 852 | 871 | 65 |
| 66 | 977 | 9769 |  | 975 |  |  |  |  |  |  | 172 |  |  |  |  | 825 | 8428 | 3620 |  |  |  |
| 67 | 977 |  |  | 975 |  |  |  |  |  | 66.97 | 75 |  |  |  |  |  |  |  |  |  | 67 |
| 68 | 97 |  |  |  |  |  |  |  |  |  |  |  |  | 83 | 85 | 8789 |  | 9184 |  |  | 68 |
| 69 | 976 | 97 | 9753 | 9748 | 97 | 9737 | 9731 | 9725 | 9720 | 68.971 | 806 | 826 | 8463 | 866 | 8865 | 9065 | 9266 | 974 |  |  |  |
| 70 | ， | 9755 | 9749 | 9744 | 9738 | 9733 | 9727 | 9721 | 9716 | 69.9710 | 1.832 | 85 | 8731 | 8935 | 9138 | 342 |  | 97 | 9952 |  | 70 |
| 71 | 975 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 97 |  |  |  |  |  |  |  |  |  | 88 | 905 | 9266 | 9475 | 9685 | 9894 | －10 | － | 0522 | 073 | 72 |
|  | 9750 | 9744 | 9739 | 9733 | 9727 | 9721 | 9715 | 9709 | 9703 | 72.969 | 910 | 9321 | 9534 | 9746 | 9958 | ＋17 | 03 | 0 | － | 13 | 73 |
|  | 9746 | 9741 | 9731 | 97 |  |  |  | 9705 |  | 73.969 | 1.937 | 9586 | 980 | d 26 | 0232 | 0723 | 0662 | 0877 | 1092 |  | 74 |
| 75 | 9743 | 9737 | 9731 | 9726 | 20 | 14 | 9708 | 9702 | 9695 | 74.968 | 963 | 9851 | ＋060 | 028 | 050 | 072 | 09 | 115 | 137 | 159 | 75 |
| 76 | 97 | 9734 | 9728 | 9722 | 16 | 10 | 04 | 9698 | 991 |  | 8 | ＋115 | 03 | 055 |  | 099 | 150 | 172 | 66 |  | 76 |
| 77 | 9736 | 9730 | 9724 | 9718 |  | 06 | 97 | 9694 | 9687 |  |  |  |  | 082 | 1 | 1 | 50 | 1724 |  |  |  |
| 78 | 9733 | 9727 | 9721 | 9711 |  |  |  | 960 | 帾 | 77.967 |  |  | 087 | 109 | 132 | 1552 | 1779 | 200 | 223 | 24 | 78 |
| 79 | 9729 | 9723 | 9717 | 9711 | 9705 | 9698 | 9692 | 9686 | 9679 | 78.967 | 2.068 | 0909 | 1139 | 1369 | 159 | 1828 | 2058 | 2288 | 251 | 274 | 79 |
| 80 | 9726 | 9720 | 9714 | 9707 |  | 9695 |  |  | 9675 | 79 | 2.0942 | 1174 | 4 | 1639 | 187 | 105 | 2337 | 2570 | 203 |  | 80 |
| 81 | 9722 | 9716 |  |  |  |  |  |  |  |  |  |  | 1674 |  | 219 | 281 | 216 |  |  |  | 81 |
| 82 | 9719 | 9713 | 9706 | 9700 | 9693 | 9687 |  | 9674 | 9667 | 81.96 | 214 | 1704 | 1942 | 2180 | 2419 | 2657 | 2896 | 3134 | 337 |  | 82 |
| 83 | 976 | 9709 |  |  |  | 88 | 寿 | 9670 | 9663 | 82.965 | $2 \cdot 1727$ | 1968 | 2210 | 2451 | 2692 | 293 | ， | 3416 | 析 |  | 83 |
| 8 | 9712 | 9706 | 9699 | 9693 | 886 | 9679 | 9672 | 9666 |  |  |  | 2233 | 2477 | 2721 | 2966 | 3210 | 3454 | 3698 | 394 | 418 | 84 |
| 85 | 970 | 9702 | 9696 | 9689 |  | 9675 | 9669 | 966 | 9655 | 84．96 | $2 \cdot 225$ | 2498 | 2745 | 2992 | 32 | 3486 | 773 | 398 | 422 | 447 | 85 |
| 86 | 970 | 9699 | 208 | 9685 |  | 9672 | 9665 | 9658 | 651 | 85 | 2512 | 762 | 3012 | 3262 | 37 | 37 |  | 4263 | 4513 |  | 86 |
|  | 970 | 969 | 9685 | 967 | 671 | 65 | 965 | 9654 |  |  |  | 327 | 328 | 3533 | 318 | 403 | 4292 | 4543 | 5083 | 505 | 87 |
| 88 | 969 | 969 | 9685 | 967 | 9671 | 966 | 9657 | 9650 | 9642 | 87.963 | ． 30 | 3292 | 3547 | 3803 | 4059 | 4315 | 4571 | 4827 | 508 | 533 | 88 |
| 89 | 9695 |  | 88 | 674 | 687 | 660 | 源 | 9646 | 638 | 88.963 |  | 3556 | 3815 | 407 | 433 | 459 | 4850 | 5101 | 536 | 5 | 89 |
| 90 | 9692 | 9685 | 9678 | 9671 | 664 | 9656 | 9649 | d |  |  |  | 3821 | 4083 | 寿 | － | 486 | 5129 | 539 | 565 | 591 | 90 |
|  | 9688 | 9681 | 74 | 9667 | 9660 | 9653 | 645 | 638 | 30 |  | 2.3821 | 086 | ， | 461 | 48 | 5144 | 5409 | 567 | 593 | 620 | 91 |
| 92 | 9685 | 678 | 671 | 63 |  | 649 | 9641 | 9634 | 9626 | 9196 | $2 \cdot 40$ | 4350 | 4618 | 4885 | 5153 | 5420 | 5688 | 5955 | 6223 | 64 | 92 |
| 93 | 968 | 9674 | 9667 |  | 9652 | ：645 |  | 析 | 622 | 92961 |  | 4615 | 4885 | 5156 | 5426 | 5697 | 596 | 6238 | 6508 | 670 | 93 |
| 94 | 9678 | 9671 | 63 | 9656 | 964 | 9641 | 33 | 9626 | 9618 | 93.961 | $2 \cdot 460$ | 4880 | 5153 | 542 | 570 | 5973 | 6246 | 6520 | 679 | 70 | 94 |
| 95 | 9674 | 19667 |  |  |  | 9637 |  | 9622 | 14 | 94.9606 | $2 \cdot 4868$ | 514 | 5421 | 569 | 5973 | 6249 | 6526 | 6802 | 7078 |  | 95 |
| 96 | 9671 |  |  |  |  | 963 |  | 寿 |  |  |  |  |  |  |  | 析 | 805 | 析 | 析 |  | 96 |
| 97 | 9668 |  | 553 | 645 | 9637 | 9630 | 9622 | 9614 | 9606 | 96.959 | 2539 | 5674 | 5956 | 6238 | 6520 | 6802 |  | 736 | 76 | \％ | 97 |
|  | 9664 | 657 |  |  |  | 9626 | 618 | 610 | 602 | $97 \cdot 95$ |  | 593 | 6223 | 6508 | 6793 | 7078 | 7363 | 7648 | 7933 | 821 | 98 |
|  | 9661 | 9653 |  |  |  | 9618 | 9614 | 960 | 9598 | 99．059 | 2.5915 | 6203 | 6459 | 6709 | 7067 | 7631 | 7642 | 7930 | 3218 | 8506 |  |
| 100 | 9657 | 9650 | 9642 | 963 | 9626 | 9618 | 9610 | 9602 | 9594 | 99.958 | 2.6177 | 6468 | 6759 | 7049 | 7340 | 7631 | 7922 | 8212 | 8503 | 3794 | 100 |
|  | $30^{\prime}$ | $29^{\prime}$ | ｜ $28^{\prime}$ | ｜ 27 | $26^{\prime}$ | $25^{\prime}$ | 24 | 2 | 122＇ | $21^{1}$ | 30 | $2 y^{\prime}$ | $28^{\prime}$ | 27 | 26 | 25 | $24^{\prime}$ | $23^{\prime}$ | $22^{\prime}$ | $21^{1}$ |  |
|  |  |  |  |  |  | NE． |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 1 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $1^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 40 | $41^{\prime}$ | $42^{\prime}$ | 43＇ | 44＇ | $45^{\prime}$ | $46^{\prime}$ | $47^{\prime}$ | 48＇ | $49^{\prime}$ | $40^{\prime}$ | 41 | 42 | $43^{\prime}$ | 44 | 45 | 46 | 47 | $48^{\prime}$ | 49 |  |
|  | 9996 | 9996 | 9996 | 9996 | 99 | 9995 | 9995 | 9995 | 9995 | ＇999 | 0291 | 029 | 0297 | 030 | 0302 | 030 | 0308 | 0311 | 0314 | 0317 |  |
|  |  |  |  | 99 | 9991 | 99 | 99 | 99 | 99 | 1.999 |  |  | 0593 | 05 |  |  | 0617 | 0622 | 0628 | 0634 |  |
|  |  | 9987 | 998 | 9987 | 9986 | 9986 | 9986 | 9985 | 92 | 2.98 |  | 08 | 089 | 0899 | ， | 0916 | 0925 | 0934 | 0942 | 0951 |  |
|  | 998 | 99 |  |  | 99 | 988 | 998 | 9981 | 9980 | 3.9980 | 1 | 11 | 11 | 1198 | 12 | 1222 | 1233 | 1245 | 1256 | 12 |  |
| 5 | 9979 | 9978 | 9978 | 9978 | 9977 | 9977 | 9976 | 776 | 9975 | 4.9975 | 54 | 14 | 148 | 1498 | 1512 | 1527 | 1541 | 1556 | 157 | 1585 |  |
|  | 9975 | 9974 | 9974 | 9973 | 9973 | 99 | 9971 | 9971 | 9970 |  | 1745 | 1763 | 1780 | 1797 | 1815 | 183 | 850 | 1867 | 85 | 1902 |  |
|  | 99 | 9970 | 9969 | 9969 | 9968 | 98 | 9967 |  |  |  |  | 20 | 20 | 2097 | 2117 | 2138 | 2158 | 2178 | 2199 |  |  |
|  | 996 | 996 | 9965 |  | 996 | 996 | 9962 | 9961 | 996 | 7.996 | 2327 | 2350 | 2373 | 2397 | 2420 | 2443 | 2466 | 2490 | 2513 | 25 |  |
|  | 9962 | 9 |  |  |  | 995 |  |  |  |  | 2618 | 26 | 267 | 26 | 2722 | 27 | 27 | 2801 | 2827 |  |  |
| 10 | 9958 | 9 |  |  |  |  |  |  |  |  |  | 2938 | 2967 | 2996 | 302 | 3054 | 3083 | 3112 | 3141 | 3170 |  |
| 11 | 995 | 9953 | 9952 |  | 9950 | 9949 | 9948 | 9947 | 9946 | 10.9945 | 19 | 3231 | 3263 | 3295 | 3327 | 3359 | 3391 | 3423 | 3455 | 3487 |  |
| 12 | 994 | 994 | 994 | 9946 | 99 | 994 | 9943 | 9942 |  |  | 480 | 35 | 35 | 3595 | 36 | 36 | 0 | 37 | 3769 |  |  |
| 13 | 99 | 99 | 9943 | 9942 | 9941 | 9939 |  |  | 9936 | 12 | 析 | 38 | 3857 | 3894 | 3932 | 3970 | 4008 | 4046 | 40 | ， |  |
| 14 |  |  |  |  | 9936 | 99 |  | 9932 | 9931 | 13.993 | 401 | 411 | 415 | 4194 | 42 | 427 | 4316 | 4357 | 43 | 44 |  |
| 15 | 993 | 9935 | 34 | 9933 | 9931 | 9930 | 29 | 9927 | 9926 | 14.992 | 4363 | 4406 | 4450 | 4494 | 453 | 4581 | 4624 | 4668 | 47 | 475 |  |
| 16 | 993 | 993 | 99 | 9928 | 9927 | 9925 | 9924 | 9923 | 992 |  | 4654 | 4700 | 47 | 4793 | 48 | 48 | 4933 | 4979 | 5026 |  |  |
| 17 | 99 |  |  |  | 9922 |  |  | 9918 | 9916 | 16.99 |  |  |  |  | 5142 | 51 | 5241 | 5290 |  |  |  |
| 18 | 992 | 9922 |  | 9919 | 9918 | 9916 | 9914 | 9913 | 9911 | 17 | 5235 | 52 | 53 | 53 | 54 | 54 | 5549 | 5602 | 56 | 570 |  |
| 19 | 992 | 9918 | 9916 |  | 9913 |  |  |  |  | 1 |  |  |  |  | 57 | 58 |  | 5913 |  |  |  |
| 20 | 9 |  | 9912 |  |  |  |  | 9903 |  | 19.989 |  | 5875 |  | 599 | 6050 | 61 | 6166 | 6224 | 6282 | 6340 |  |
| 21 | 99 | 9909 |  |  |  |  |  |  | 9896 | 20.989 | 6108 |  | 6230 | 629 | 6352 | 6413 | 6474 |  |  | 6657 |  |
| 22 | 990 | 990 | 9903 |  |  | 989 | 9895 |  |  | 21.98 | 339 | 64 | 652 | 659 | 66 | 67 | 6782 | 6846 |  | 697 |  |
| 23 | 990 | 99 | 9899 | 9897 | 9895 | 989 | 9891 | 9889 | 9887 | 22.988 |  | 67 | 68 | 689 | 69 | 70 | 7091 | 7158 | 72 | 729 |  |
| 2 | 989 | 989 | 9894 |  |  | 98 |  | 9884 | 9882 |  | 698 |  |  |  | 7259 | 7329 | 7399 | 7469 | 7539 | 760 |  |
| 25 | 989 | 989 | 9890 | 88 |  | 98 | 9881 | 879 | 9877 | 24. | 72 | 73 | 7417 | 7489 | 75 | 763 | 770 | 778 | 78 | 7925 |  |
| 26 | 989 | 9888 | 9886 | 9883 | 9881 | 9879 | 9876 | 9874 | 9872 | 25.986 | 7562 | 7638 | 7713 | 7789 | 7864 | 7940 | 8016 | 8091 | 8167 | 8242 |  |
| 27 | 98 |  |  |  | 9876 |  |  |  |  |  |  |  | 8010 |  |  |  | 8324 | 840 |  |  |  |
| 28 | 9882 | 987 | 9877 | 987 | 9872 |  | 9867 | 9864 | 986 |  |  | 8225 | 8307 |  |  | 855 | 863 | 871 | 879 | 887 |  |
| 29 | 9877 | 987 | 9872 |  | 9867 |  | 9862 |  | 985 | 28.985 | 435 | 8519 | 8603 | 86 |  | 8856 | 89 | 903 | 9109 | 19 |  |
| 30 | 98 | 9871 | 9868 | 9865 | 9863 | 9860 | 9857 | 9855 | 9852 | 29.9849 | 8725 | 13 | 8900 | 898 | 9074 | 162 | 9249 | 9336 | 9423 | 9510 |  |
| 31 | 9869 | 9866 | 9864 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 986 | 98 | 9859 |  |  |  |  |  |  | 31．98 |  |  |  |  |  |  | 9865 | 9958 | ． 051 | 014 |  |
| 33 | 986 | 985 | 85 | 9852 | 9849 | 9846 | 9843 |  |  | 32.983 | 59 | 9694 |  |  |  | 107 | 017 | 02 | 0366 | 046 |  |
|  | 98 |  |  |  |  |  |  |  | 983 |  |  |  |  |  | 02 | 038 | 048 | 058 | 0680 | 077 |  |
| 35 | 985 |  |  |  | 9840 | 9837 | 34 | 9830 |  | 34．982 | 1.0180 | 0281 | 883 | 048 | 05 | 068 | 079 | 0892 | 0994 | 109 |  |
| 36 | 984 | 9845 | 9842 | 9838 | 9835 | 9832 | 9829 | 9826 | 9822 | 35.981 | 1.0470 | 0575 | 0680 | 078 | 0889 | 0994 | 1099 | 120 | 1308 | 1413 |  |
| 37 | 984 | 9840 | 9837 | 9834 | 983 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 983 | 983 | 9833 | 982 | 982 | 9823 | 9819 | 9816 | 9813 | 37.98 | 103 | 1163 |  |  |  | 1605 |  |  |  | 234 |  |
| 39 | 983 | 9 | 9828 |  |  |  |  |  | 980 |  |  | 14 |  |  |  | 1910 | 20 |  |  |  |  |
| 40 | 983 | 9827 | 9824 | 9820 | 9817 | 9813 | 9810 | 9806 | 9803 | 39．9799 | $1 \cdot 1634$ | 175 | 1866 | 1983 | 2099 | 221 | 2334 | 2448 | 2564 | 268 |  |
| 41 | 9827 | 9823 | 9820 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 982 | 9819 | 9815 |  |  |  |  |  |  | 4 | 砣 |  |  |  |  |  |  |  |  |  |  |
| 43 | 98 | 9814 |  | 9807 | 9803 |  |  | 97 |  | 42.97 | ． 250 | 26 |  | 288 | 3007 | 3132 | 32 | 3382 |  |  |  |
|  |  |  |  | 9803 |  | 9795 | 791 | 9787 | 9783 | 3.9 | 279 | 2925 | 305 | \％181 |  | 3437 | 3565 |  |  | 394 |  |
| 45 | 98 |  |  |  |  |  | 86 | 82 | 9778 | 44.97 | ． 3088 | 3219 | 335 | 348 | 361 | 374 | 887 | 400 | 413 | 4266 |  |
| 46 | 98 |  |  |  |  |  |  |  |  |  |  | 35 |  |  | 3 | 4048 | 4181 | 43 |  |  |  |
| 47 |  |  |  |  |  |  | 9777 | 9772 |  | 46 |  | 38 | 394 | 408 | 42 | 435 | 44 | 46 | 4763 |  |  |
| 48 | 97 |  |  |  |  | 9776 | 9772 |  |  | 47 | 3961 | 41 | 424 |  | 45 | 465 |  | 493 |  | 521 |  |
| 49 | 97 |  |  |  |  |  |  |  |  |  |  |  |  |  | 48 | 496 |  |  |  |  |  |
| 50 | 978 | 9784 |  | 97 | 9771 | 9767 | 9762 | 9758 | 9753 | 49 | $1 \cdot 4542$ | 46 | 4833 | 49 | 51 | 526 | 54 | 5560 | 5705 | 5851 |  |
| 51 | 9784 | 9780 | 9776 | 977 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 97 | 977 | 9771 | 976 | 9762 | 975 | 53 | 9748 | 9743 | 1.973 | － 5124 | 52 | 54 |  | 5729 | 588 | 631 | 61 |  |  |  |
| 53 | 977 | 977 | 9767 |  |  |  |  |  |  | 52.9 |  |  |  |  |  |  | 63 | 648 |  |  |  |
| 54 |  | 67 |  |  |  | 48 | 43 |  |  | 53.97 | 1.5706 | 5863 | 60 |  | 6334 | 649 | 664 | 680 | 6962 | 711 |  |
| 55 | 97 | 9763 |  | 9753 | 9748 | 9743 | 9739 | 9734 | 9729 | －9 | 1.599 | 157 | 631 | 6476 | 6636 | 679 | 695 |  | 7276 | 7436 |  |
| 56 | 97 | 9758 |  |  | 97 |  |  |  | 9724 |  |  | 645 |  |  |  | 710 |  |  |  |  |  |
| 57 | 97 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  | 9740 |  | 9729 | 9724 | 9719 | 9714 | 57. | 1.6869 | 7038 | 7206 |  |  | 71 | 788 | 805 | 218 | 838 |  |
| 59 | 975 | 974 |  |  |  |  |  |  |  |  |  |  |  |  |  | 8018 |  |  |  |  |  |
| 60 | 97 | 9741 | 9736 | 9731 |  | 97 | 9715 | 9709 | 9704 | 59.9698 | $1 \cdot 7451$ | 762 | 7800 | 7974 | 8149 | 32 | 849 | 8672 | 8846 | 9021 |  |
| 61 | 97 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 973 | 97 |  |  |  |  | 9705 | 9700 | 969 | 61 | 8 | 8213 |  | 85 | 8754 | 893 | 911 | 923 |  |  |  |
| 63 | 973 | 97 |  |  |  |  |  |  |  | 62. |  | 850 |  |  |  | 92 | 94 |  |  |  |  |
| 64 |  |  |  |  |  |  | 析 |  |  |  |  |  |  |  |  | 954 |  |  |  |  |  |
| 65 | 972 | 9719 | 9714 | 9708 | 9703 | 9697 | 9691 | 968 | 9679 | 4．967 | 1.89 | 909 | 928 | 94 | 966 | 985 | ＋03 | 02 | 0417 | 0606 |  |
| 66 | 972 | 97 |  | 97 |  |  |  |  | 9674 |  |  |  |  |  |  |  |  | 0539 |  |  |  |
| 67 | 97 | 97 |  |  |  |  | 9682 |  |  |  |  | 968 |  | ＋ | 0266 |  | 06 | 085 |  |  |  |
| 68 |  |  |  |  |  |  | 967 | 967 | 966 | 67.96 |  |  |  |  |  | 076 |  |  |  |  |  |
| 6 | 970 | 9702 | 9696 |  |  |  | 9672 | 9666 | 9660 |  |  | 02 |  |  |  | 107 | 12 | 14 | 167 | 187 |  |
| 70 | 970 | 9698 | 9692 | 968 |  |  | 9667 | 96 | 9655 | 69.9648 | 2.0359 | 0563 | 1 |  | 1173 | 1377 | 1 | 178 | 1988 | 218 |  |
| 71 |  | 969 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 96 | 96 | 9683 | 967 | 9671 | 9664 | 9658 | 965 | 964 | ．9638 | ． 09 | 1150 | 136 |  | 1778 |  |  | 2406 |  |  |  |
| 73 | 969 | 968 | 96 | 967 | 9666 | 9660 | 9653 | 9646 | 9640 | 72.963 | $2 \cdot 12$ | 144 | 165 | 18 | 208 | 22 | 25 | 271 | 293 | 314 |  |
|  | 9 |  |  |  |  |  |  |  |  |  |  | 1738 |  | 168 |  |  |  |  |  |  |  |
| 75 | 968 | 9676 | 670 | 9663 | 9657 | 9650 | 64 | 9637 | 963 | 74．9623 | $2 \cdot 181$ | 2032 | 225 | 246 | 283 | 290 | 312 | 33 | 355 | 377 |  |
| 76 | 9679 | 9672 | 9666 | 9659 | 9652 | d | 9639 | 9632 | 9625 |  | 2.21 | 2325 | 254 | 27 | 298 | 320 | 343 | 36 | 3872 | 409 |  |
| 77 | 9674 | 9668 | 9661 | 96 |  | 9641 | 9634 | 962 | 9620 | 76.9 |  | 261 | 284 | 306 | 329 | 351 | 373 | 396 | 41 | 44 |  |
| 78 | 967 | 9663 |  |  | 9643 | 9636 | 923 | 9 | 96 | 77.96 |  | 291 | 位 | 336 | 309 | 382 | 439 | 428 | d | 5 |  |
| 79 | 966 | 9659 | 965 | 96 | 9638 | 96 | 9625 | 9617 | 961 | 78.960 | $2 \cdot 29$ | 320 | 343 | 36 | 389 | 4125 | 435 | 458 | 481 | 50 |  |
| 80 | 9662 | 9655 | 9648 | 9641 |  | 962 | 9620 | 9613 | 9605 | 79.9598 | 268 | 3500 | 373 | 3966 | 4198 | 4431 | 46 | 489 | 5129 | 536 |  |
| 81 | 965 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 965 | 9646 | 9639 | 96 | 962 | 9618 | 9610 | 96 | 9595 | 81.958 | $2 \cdot 38$ | 408 | 432 | 456 | 4803 | 504 | 528 | 5 | 5 5157 | 599 |  |
| 83 | 96 | 9642 | 96 | 9627 | 962 | 13 | 9606 | 9598 | 9590 | 82 ＇958 | 2.414 | 438 | 462 | 486 | 510 | 53 | 558 | 583 | 607 | 631 |  |
| 84 | 9645 | 963 | 9630 | 9 | 961 | 9608 | 9601 | 9593 |  | － | 2.4431 | 4675 | 92 | 516 | 540 | 565 | 589 | 析 | 638 | 629 |  |
|  | 9640 | 9633 | 9626 | 961 | 961 | 9604 | 9596 | 958 | 958 | 84．957 | $2 \cdot 4722$ | 496 | 521 | 5463 | 571 | 59 | 620 | 645 | 669 | 69 |  |
| 86 | 963 | 19629 | 9622 | 961 | 9606 |  |  |  | 957 | 㖪 | ． 50 | 526 | 551 | 576 | 601 | 62 | 651 | 676 | 701 | 72 |  |
| 87 | 9632 | 9625 | 9617 | 9610 | ， | 9594 | 586 | 9579 | 957 | 86.956 | 5 | 555 | 581 | 6063 | 631 | 656 | 682 | 707 | 73 |  |  |
| 88 | 962 | 9620 | 9613 | 960 | 959 | 9590 | 9582 | 9574 | 956 | 87.95 | 2.55 | 585 | 610 | 636 | 6618 | 687 | 713 | 矿 | 79 | 889 |  |
| 89 | 962 | 9616 | 960 | 96 | 9593 | 9585 | 957 | 9569 | 956 | 88.955 | 2.58 | 614 | 6403 | 666 | 692 | 717 | 743 | 7697 | 79 | 821 |  |
| 90 | 9619 | 9612 | 9604 | 9596 | 9588 | 9580 | 957 | 9564 | 9556 | 89.954 |  | 6438 | 6700 | 696 | 7223 | 748 | 77 | 8008 | 827 | 85 |  |
| 91 | 961 | 960 |  |  | 989 | 957 | 9563 |  | 955 |  | ． 67 | 702 | 析 |  | 728 |  |  |  |  |  |  |
| 92 | 961 | 960 | 950 | 95 | 957 | 957 | 9563 | 955 | 954 | 9195 | $2 \cdot 67$ | 702 | 729 | 75 | 782 | 80 | 836 | 86 | 889 | 9 |  |
| 93 | 960 | 9599 | 9591 | 958 | 9574 | 9566 | 9558 | 9550 | 9541 | 92.953 | 27049 | 7319 | 759 | 786 | 8130 | 840 | 867 | 89 |  |  |  |
|  | 9602 | 9594 | 586 |  | 957 |  | 9553 | 9545 | 9536 | 93.952 | 27340 | 761 | 788 | 析 | 843 | 80 | 8980 | 25 | 952 |  |  |
| 95 | 9598 | 9590 | 9582 | 957 | 9565 | 9557 | 9548 | 9540 | 9531 | 94．9523 | 2.7630 | 7907 | 818 | 845 | 873 | 901 | 928 | 956 | 98 | ${ }^{+1}$ |  |
| 96 | 959 | 9586 | 9578 | 9569 | 9561 | 9552 | 9544 | 9535 | 9526 | 9651 |  | 8200 | 8480 | 875 | 9038 | 9317 | 959 | 987 | 15 | 0433 |  |
| 97 | 9590 | 9581 | 9573 | 9565 | 9556 | 9548 | 9539 | 9530 | 9521 | 96.951 | 2.8212 | 8494 | 8776 | 905 | 934 | 962 | 9904 | 18 | 0468 |  |  |
|  | 958 | 95773 | 956 | 95 | 955 | 95 | 9534 | 9525 | 9516 | 97.95 | 2.850 | 8788 | 907 | 935 | 964 | 992 | －213 | 0498 | 078 | 106 |  |
|  | 958 | 9573 | 9564 | 955 | 9547 | 9538 | 529 | 9521 | 9512 | 98.950 | 2.879 | 9082 | 9370 | 9657 | 94 | －233 | 052 | 0809 | 109 | 138 | 99 |
| 100 | 9577 | 9568 | 9560 | 955 | 9542 | 9534 | 9525 | 9516 | 9507 | 99．949 | 2.908 | 9376 | 9666 | 9957 | ＋248 | 0539 | 0829 | 1120 | 1411 | 1702 | 100 |
|  | $20^{\prime}$ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | 15 | $14^{\prime}$ | $13^{\prime}$ | 12 | $11^{\prime}$ | $20^{\prime}$ | 19 | $18^{\prime}$ | 17 | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ | ｜ $13^{\prime}$ | $12^{\prime}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $1^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $1^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | $51^{1}$ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | $57^{\prime}$ | $58^{\prime}$ | 59 |  | $51^{\prime}$ | 52＇ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | $56^{\prime}$ | $57^{\prime}$ |  |  |  |
|  | 999 | 9995 | 9995 |  | 9995 | 9994 | 99 | 99 | 9994 |  | 320 | 0323 | 0326 | 0329 | 0332 | 0334 | 0337 | 0340 | 0343 | 0346 |  |
|  | 999 | 99 | 9 |  | 99 |  |  |  |  | 1.998 |  | 0646 | 0651 | 0657 | 0663 | 0669 | 0675 |  | 0686 | 0692 |  |
|  | 99 | 9984 | 99 |  | 998 |  |  | 9 | 9982 | $2 \cdot 998$ | 960 | 0968 | 097 | 098 | 099 | 1003 | 101 | 102 | 1030 | 103 |  |
|  | 98 | 9979 | 997 | 99 | 997 | 997 | 9977 | 9977 | 9976 | $3 \cdot 9$ | 1280 | 1291 | 130 | 131 | 132 | 1338 | 13 | 1361 | 1373 | 138 |  |
| 5 | 9974 | 9974 | 9973 |  | 9973 |  | 9972 |  | 297 |  |  | 614 |  | 1643 | 1658 | 167 | 1687 | 170 | 1716 | 173 |  |
| 6 | 9969 | 9969 |  |  |  |  |  | 9965 | 9965 | 5.996 | 1920 | 1937 | 1954 | 1972 | 1989 | 2007 | 2024 | 2042 | 2059 | 2077 |  |
|  | 9964 |  |  |  |  |  |  |  |  |  | 23 | 226 | 2280 | 230 | 232 | 23 | 2362 | 2382 | 2402 | 242 |  |
|  | 995 | 99 | 99 | 9957 | 99 | 99 | 99 |  | 995 | $7 \cdot 99$ |  | 2583 | 260 | 2629 | 2652 | 267 | 2699 | 27 | 2745 | 2769 |  |
|  | 9954 |  |  |  |  |  |  | 9948 | 994 |  | 8899 | 905 | 2932 | 2958 | 2984 | 301 | 303 |  | 3089 | 3175 |  |
| 10 | 994 |  | 9947 |  | 9945 |  | 9943 | 42 | 9941 | 9.994 | 3199 | 3228 | 325 | 328 | 33 | 334 | 337 | 34 | 3432 | 346 | 0 |
| 11 | 9944 |  | 9942 |  | 9940 | 9938 | 9937 | 9936 | 9935 | 10.993 | 351 | 35 | 358 | 361 | 3647 | 3679 | 37 |  | 3775 |  |  |
| 12 | 993 | 99 | 99 | 993 | 9934 |  | 9932 |  |  | 11.992 |  |  |  |  |  | 4014 | 404 | 4083 | 4118 | 415 |  |
| 13 | 9933 |  |  |  |  |  |  | 10 |  | 12 | 159 | 4197 | 423 | 42 | 43 | 4348 | 438 | 44 | 446 | 449 | 3 |
| 14 | 9928 | 9927 | 9926 | 9924 | 9923 | 9922 | 9920 | 19 | 9918 | 13 | 479 | 4520 | 456 | 46 | 4642 | 4682 | 47 | 4764 | 5 | 4845 |  |
| 15 | 992 | 9922 | 9920 | 9919 | 9918 |  |  | 9913 | 9912 | 14 |  | 4842 | 4886 |  | 4973 | 5017 | 5060 | 5104 | 48 | 5191 | 15 |
| 16 | 9918 | 9917 | 9915 |  | 9912 |  |  |  | 9906 | 15.9904 | 5119 | 5165 | 5212 | 525 | 5305 | 5351 | 5398 | 5444 |  | 553 | 16 |
| 17 |  |  |  |  | 9907 |  |  |  |  |  |  |  | 553 |  | 5636 | 5686 | 5735 |  |  |  | 17 |
| 18 | 99 | 9906 | 9904 | 9903 | 9901 | 9899 | 9898 | 9896 | 9894 | 17 | 5 | 5811 | 5863 | 59 |  | 6020 | 607 | 6125 | 6177 | 623 | 18 |
| 19 | 99 |  |  |  |  |  |  | 98 | 9888 | 18 | 079 | 61 | 61 | 62 | 6299 | 63 | 6410 | 6465 | 20 | 6576 | 19 |
| 20 | 98 |  |  |  |  | 9888 | 86 | 9884 | 9882 | 19.9 | 6398 | 64 | 651 | 65 | 66 | 66 | 67 | 680 | 6864 | 6922 | 20 |
| 21 | 9893 |  |  | 9887 | 9885 | 9883 | 9880 | 9878 | 987 | 20.987 | 718 | 6779 | 684 | 690 | 6963 | 7024 | 7085 | 7146 | 7207 | 7268 |  |
| 22 | 98 | 9885 | 9883 | 988 |  | 9877 |  |  |  | 21986 |  |  |  |  |  |  | 7422 |  |  |  |  |
| 23 | 98 |  | 9878 | 寿 |  |  |  | 9867 | 9865 | 22.986 |  | 7425 | 749 |  | 762 | 7693 | 775 | 7826 | 889 | 796 | 23 |
| 24 | 987 | 98 | 9873 | 870 | 9868 | 9866 | 9863 | 9861 | 985 |  |  | 7748 | 78 |  |  | 8027 | 809 | 8167 | 8236 |  | 24 |
| 25 | 987 | 9870 |  | 9865 |  |  |  | 9855 | 9853 | 24.985 | 998 | 8071 |  | 8216 | 8289 | 8361 | 8434 | 8507 |  |  |  |
| 26 | 9867 | 9864 | 9862 | 9860 | 9857 |  |  |  |  | 25.984 |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 9862 |  |  | 9854 | 9852 |  |  | 9844 |  |  |  |  | 819 |  |  |  |  |  |  |  | 27 |
| 28 | 985 | 9854 | 9851 | 9849 | 9846 | 9843 | 9841 | 9838 | 9835 | 27.983 |  | 9039 | 912 | 92 |  | 93 |  |  |  |  | 28 |
| 29 | 98 |  |  |  |  |  | 析 |  |  | 砣 | 矿 |  | 9446 | 9531 | 9615 | 9699 | 9784 | 986 | 9952 |  |  |
| 30 | 9846 |  |  |  |  | 9832 | 29 | 9826 | 9823 | 88 | 9598 | 968 | 977 | 985 | 994 | －03 | 012 | 020 | 02 | 038 | 30 |
| 31 | 9841 |  |  |  | 9830 | 9827 | 9824 | 9820 | 9817 | 30.981 | 991 | ＋008 | 009 | 018 | 0278 | 036 | 0458 | 0548 | 0639 | 072 |  |
| 32 | 9836 | 983 |  | 9827 | 9824 |  | 9818 | 9815 | 9812 |  | 238 |  | 0424 |  | 06 |  |  |  |  |  |  |
| 33 | 9831 |  |  | 9822 | 9819 | 1 |  |  | 980 |  |  |  |  |  |  | 1 | 11 | 1229 | 13 | 14 |  |
| 34 | 9826 |  |  |  | 9813 | 9810 | 06 | ． 03 | 9800 |  | ． 087 | 0976 | 107 | 1174 | 12 | 13 | 14 | 1569 | 16 | 1767 | 34 |
| 35 | 9821 | 98 | 9814 | 9811 |  |  |  | 9797 | 9794 | 34．9790 | $1 \cdot 197$ | 1299 | 1401 | 1503 | 1604 | 1706 | 1808 | 1910 | 2011 | 217 | 35 |
| 36 | 9816 | 9812 | 9809 | 9806 | 9802 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 37 | 9811 |  |  | 9800 | 979 | 9793 |  | 978 |  | $36 \cdot 97$ | － |  | 205 | 21 |  | 23 |  |  |  |  |  |
| 38 | 98 |  |  | 9795 | 979 | 9787 | 9784 | 9780 | 97 | 37.97 | ． 215 | 2268 | 237 | 24 |  |  |  |  |  |  |  |
| 39 | 9800 |  |  |  | 9786 | 9782 | 9778 |  | 976 | 976 | 247 |  |  |  | 2931 |  |  |  | 3384 |  |  |
| 40 | 9795 | 9792 |  | 9784 | 9780 | 9776 | 9772 | 768 | 97 | 97 | 1.2797 | 29 | 302 | 314 | 326 | 3378 | 349 | 36 | 372 | 384 | 40 |
| 41 | 9790 |  |  |  |  |  |  |  | 9759 | 40.975 | ． 311 | 3236 | 335 | 347 | 3594 | 371 | 383 | 395 | 4070 |  |  |
| 42 | 97 |  |  | 9773 |  |  |  | 9757 | 975 | 41.97 |  |  | 36 |  |  |  |  | 2 | 4414 |  |  |
| 43 | 97 | 97 | 9772 | 9768 | 9764 | 9759 |  | 9751 | 9747 | 42.974 | 3757 |  |  | 4132 | 42 | 4382 |  | 2 | 47 | 488 |  |
| 44 | 977 | 977 | 寿 |  |  | 9754 |  |  |  |  |  |  | 43 | 4460 | 45 | 47 | 48 | 2 | 51 |  |  |
| 45 | 9770 | 9765 | 9761 | 975 | 9753 | 9748 | 9744 | 9739 | 9735 | 44 | 1.4396 | 4527 | 46 | 4 | 49 | 5051 | 51 | 12 | 5443 | 5574 |  |
| 46 | 97 | 9760 | 9756 | 9752 |  |  | 9738 | 9734 | 9729 | 45.972 | 矿 |  | 4984 |  |  |  |  |  |  |  |  |
| 47 | 97 |  |  | 9746 | 9742 | 9737 | 9732 | 9728 | 9723 | 46.9 | 5036 |  | 531 |  | 5583 |  | 58 | 5933 | 613 |  |  |
| 48 | 97 | 975 | 9745 | 97 |  | 97 |  |  | 9717 | 47.9 |  |  |  |  |  |  |  | 6333 |  |  |  |
| 49 | 97 |  | 9740 | 9735 |  | 9726 | 21 | 9716 | 9711 | 48.97 |  | 581 |  | 61 | 62 |  | 65 | 6673 | 68 |  |  |
| 50 | 9744 | 9739 | 9735 | 9730 | 9725 | 9720 | 715 | 9710 | 9706 | 49.9700 | 5986 | 614 | 628 | 6432 | 657 | 672 | 686 | 7014 | 715 | 730 | 50 |
| 51 | 9739 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 973 | 97 | 97 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 97 | 9724 | 97 | 9714 | 9709 | 9703 | 9698 | 9693 | 9688 | 52.968 | 1.69 | 7110 |  | 7418 | 757 |  | 7880 | 035 | 8189 | 34 |  |
|  | 97 | 977 | 13 | 9708 |  | 9698 |  |  |  |  |  |  |  |  |  |  | 82 | 375 |  |  |  |
| 55 | 971 | 971 |  |  |  |  | 9687 | 9681 | 9676 | 54.967 | 1.75 | 775 | 79 | 8075 | 823 | 8395 | 858 | 8715 | 8875 | 903 |  |
| 56 | 971 |  |  |  |  |  |  |  |  |  | $1 \cdot 7916$ |  | 824 |  |  |  |  |  |  |  |  |
|  | 97 |  |  |  |  | 9681 | 76 | 70 | 9664 | 56.965 | 236 | 01 | 8567 | 8733 | 8898 |  | 9230 | 396 | 561 | 9727 |  |
| 58 | 97 | 9698 | 9692 | 968 | 9681 | 9675 |  |  |  | 57 | － | 87 |  |  |  |  |  |  |  |  |  |
| 59 | 96 |  |  |  |  |  | 64 |  | 52 | 964 | －887 | 904 | 92 | 9390 | 95 | 973 | 99 | 076 | 0248 | 04 |  |
| 60 | 9693 | 9687 | 9682 | 9676 | 9670 | 9664 | 9658 | 9653 | 9647 | 59.964 | 1.9195 | 937 | 9544 | 971 | 9893 | ${ }^{1} 06$ | 02 | 04 | 059 | 0765 |  |
| 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 96 | 9677 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 9641 |  |  |  |  |  |  |  |  |  | 254 | 143 |  | 180 |  |
|  |  |  |  |  |  |  | 9636 | 962 | 962 |  | ． 04 | 06 | 08 | 103 | 1210 |  | 15 | 1778 |  |  |  |
| 65 | 966 |  |  |  |  |  |  |  |  |  |  |  |  | 1362 | 155 | 17 | 192 | 2118 | 2307 |  |  |
| 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 96 | 96 | 9639 | 9633 | 9626 | 9620 | 9613 | 9606 | 959 | $67 \cdot 95$ | 2.17 | 19 | 21 | 234 | 254 |  |  |  |  |  |  |
| 69 | 96 | 9640 | 9634 | 9627 |  | ， | 9607 |  |  | 958 |  | 227 | 247 | 2676 | 287 | 3078 | 271 |  |  |  |  |
| 70 | 9642 | 635 | 9629 | 962 | 9615 | 608 | 9602 | 959 | 558 | 69.958 | 2.239 | 259 | 2802 | 300 | 320 | 341 | 361 | 381 | 40 | 422 |  |
| 71 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | ， | 9625 | 9618 | 96 | 9604 | 95 |  |  | 9576 | 71.95 | ． 30 |  |  | 3662 |  | 408 | 4290 | 450 |  | 49 |  |
| 73 | 96 | 9620 |  | 9606 |  |  | 9584 |  | 9570 | 72.95 |  |  |  |  | 42 | 441 | 4628 | 510 |  |  |  |
|  | 9621 |  |  |  |  |  |  | 957 | 9564 | 73 | $2 \cdot 36$ |  | 41 | 432 | 45 |  | 49 | 5180 |  |  |  |
| 75 | 9616 | 9609 | 9602 | 9595 | 9588 |  |  | 956 |  | 74．955 | $2 \cdot 3994$ | 4212 | 4430 | 464 | 4866 | 5084 | 5302 | 552 | 539 | 595 |  |
| 76 | 96 | 9604 | 9597 |  |  |  |  | 9560 |  |  |  |  | 4756 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 9562 | 958 | ， | 76.953 |  |  | 5 | 536 |  | 508 | 5915 | 620 |  |  |  |
| 78 | 960 | 95 | 9586 | 957 | 9571 | 956 | 9556 | 9548 | 954 | 77.953 | $2 \cdot 49$ | 518 | 5407 | 563 | 586 | 60 | 6315 | 654 | 67 | 69 |  |
| 79 | 9596 | 9588 | 矿 | 9573 |  | 9558 |  | 543 | 9535 | 78.952 |  | 55 | 5733 | 5963 | 6193 | 642 | 6652 | 6882 | 711 | 75 |  |
| 80 | 95 | 9583 | 9575 |  |  | 552 |  |  | 9529 | －95 | 2.5594 |  | 60 | 629 | 652 | 675 | 698 | 722 | 745 | 768 |  |
| 81 | 9585 |  |  |  |  |  |  |  |  |  |  |  |  | 析 | 68 | 仡 | 7327 | 㖪 |  |  |  |
| 82 | 9580 | 9573 | 956 | 9557 | 9549 | 954 | 95 | 9525 | 951 | 195 | $2 \cdot 62$ | 647 | 67 | 6949 | 71 | 74 | 76 | 790 | 81 | 83 |  |
| 83 | 9575 | 9567 | 9560 |  |  | 536 |  | 9519 | 9517 | 95 | $2 \cdot 6554$ | 679 | 7036 | 727 | 7519 | 7760 | 800 | 243 |  | 872 |  |
| 84 | 957 |  |  |  |  | 9530 | 952 | 9514 | 950 | 83.949 | $2 \cdot 687$ | 71 | 736 | 760 | 785 | 80 | 8339 | 858 | 88 | 907 |  |
| 85 | 956 | 9557 | 9549 |  |  |  | 9516 |  | 9499 | 949 | 2.719 |  | 7688 | 7935 | 8182 | 8429 | 8676 | 89 | 917 | 94 |  |
| 86 | 9560 | 9552 |  |  |  | 9519 |  |  |  |  |  |  |  | 263 |  |  |  | 析 |  |  |  |
| 87 | 9555 | 954 | 538 |  | ， | 513 | 9， |  | 9488 | 869479 | $2 \cdot 7833$ | 808 | 839 | 5921 | 815 | 9 | 931 | 964 |  |  |  |
| 88 | 9550 | 9541 | 9533 | 9525 | 516 | 950 | 949 | 9490 | 9482 | 87.947 | 2.815 | 84 | 866 | 8921 | 91 | 94 | 968 | 994 | －2 | 045 |  |
| 89 | 9544 | 9536 | 9528 | 519 | 951 | 502 | 9493 | 485 | 476 | 94 | 2.8473 | 873 | 899 | 9249 | 950 | 976 | ${ }^{0} 26$ | 28 | 054 |  |  |
| 90 | 9539 | 9531 | 9522 | 9514 | 9505 | 496 | 48 | 9479 | 9470 | 39.946 | ．879 | 9055 | 9316 | 957 | 84 | 110 | 036 | 062 | 088 | 11. |  |
|  | 953 | 19526 | 9517 | 9508 | 9500 | 949 | 9482 | 9473 | 9464 |  |  | 保 | 9642 | 990 | － | 436 |  | ， | 1 |  |  |
| 92 | 9529 | 9520 | 9512 | 9503 | 9494 | 85 | 9476 | 946 | 9458 | 91.94 | 2.943 | 970 | 99 | ＋23 | 05 | － | 10 | 130 | 157 | 18 |  |
|  | 9524 | 9515 | 950 | 9498 | 9489 | 985 | 9471 | 9461 | 452 |  |  |  | 0294 | 056 | 83 | 1 | 1375 | 1645 |  |  |  |
|  | 951 | 9510 | 9501 | 9492 | 9483 | 947 | 94 | 9456 | 9446 | 93.943 | 3.00 | 03 | 0619 | 0893 | 116 | 143 | 1712 | 198 | 2259 | 25 |  |
| 95 | 9514 | 9505 |  |  | 9478 |  | 9459 |  |  | 943 | 3.0393 |  | 0945 | 1221 | 1497 | 17 | 2050 | 2326 | 2602 |  |  |
| 96 | 9509 |  |  |  | 942 | 9463 |  |  | 极 |  | 3.0713 | 098 | 127 | 1550 | 1829 | 2108 | 2387 | 266 |  |  |  |
|  | 950 |  | 9485 | 9476 | 9467 | 9457 |  | 9438 | 9429 | 96.941 | ， | 1315 | 1596 | 185 | 2161 | 2443 | 2725 | 仡 |  | 3 |  |
|  | 9498 | 9489 | 9480 | 9471 | 946 | 9452 | 9442 | 9432 | 9423 | 97.941 | 3．135 | 163 | 1922 | 220 | 249 | 277 | 3062 | 3347 | 3632 | 3917 |  |
| 99 | 9493 | 884 |  | 865 | 9456 | 944 | 9436 | 9427 | 417 | 98.9407 | 3． 7672 | 1960 | 2248 | 2536 | 2824 | 3111 | 3399 | 368 |  | 263 |  |
|  | 9488 | 9479 | 469 | 9460 | 9450 | 9441 | 9431 | 9421 | 411 | 99.940 | 3．1992 | 2283 | 2574 | 284 | 3155 | 3446 | 3737 | 4027 | $43!8$ | 609 |  |
|  | $10^{\prime}$ | ${ }^{9}$ | $8^{\prime}$ | 7 | $6^{\prime}$ | 5 | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ | $1^{\prime}$ | ${ }^{\prime}$ | $9^{\prime}$ |  |  | $6^{\prime}$ | $5{ }^{\prime}$ | $4^{\prime}$ | $3{ }^{\prime}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.

| $2{ }^{\circ}$ |  |  |  |  | Cosine. |  |  |  |  |  | Snne. |  |  |  |  |  |  |  |  |  | $2^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | $1^{\prime}$ | $2^{\prime}$ | 3'1 | $4^{\prime} \mid$ |  | $6^{\prime}$ |  |  |  |  |  |  |  | $4^{4}$ | $5^{7}$ | $6^{\prime}$ |  |  |  |  |
|  | 9994 | 999 | 9994 | 9994 | 999 | 993 | 99 | 9993 | 9993 | . 9993 | 0349 | 52 | 2355 | 2358 | 0361 | 64 | 366 | 69 | 72 | 0375 |  |
|  |  | 99 | 9987 |  |  |  |  |  |  | 1.998 | 0698 | 0704 | 10 | 0715 | 0721 | 27 | 0733 | 39 | 45 | 0750 |  |
|  | 9982 |  | 9981 |  |  | 9980 |  |  |  |  | -1047 | 105 | 1064 | 1073 | 1082 | 1091 |  | 8 | 1117 |  |  |
|  |  |  |  |  |  |  |  | 9973 |  |  |  | 140 | 1419 | 1431 | 1442 | 1454 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 4.996 | 1745 | 1760 | 1774 | 1789 | 1803 | 1818 | 1832 | 1847 | 1861 |  |  |
|  | 9963 | 9963 |  | 9962 |  |  |  |  | 9958 | 5.995 | 2094 | 2111 | 2129 | 2146 | 2164 | 2181 | 2199 |  | 2234 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9951 | 9950 | 9950 | 9949 | 9948 |  |  |  | 9945 |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 | ${ }^{1} 99945$ |  |  |  |  | 9941 | 9940 | 9939 | ${ }_{993}^{993}$ | 9, | 3141 3490 | 3167 3519 | 3193 3548 | 32 | 3246 <br> 3606 | 327 | 329 | 33 | 335 |  | 0 |
| 11 | 99 | 99 | 99 | 9930 | 9928 | 9927 | 9926 | 9925 | 9924 |  | 3839 |  |  |  | 3972 |  |  |  |  |  |  |
| 12 | 993 | 99 | 9924 | 9923 |  | 9921 | 9919 | 9918 | 9917 | 11. | 188 | 42 | 4258 | 4293 | 4327 | 4362 | 4397 | 32 | 4467 |  |  |
| 1 |  |  | 9918 |  |  | 99 | 9913 | 9911 | 9910 | 12.9 | 4537 | 4575 | 4613 | 4650 | 4688 | 4726 | 4764 | 4801 | 339 |  |  |
|  |  |  |  |  |  |  |  |  |  | 13 |  | 492 | 49 | 50 | 5049 | 5089 | 5130 | 5171 | 5212 |  | 14 |
| 15 | 159909 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 15 |
|  |  |  |  |  |  |  |  |  |  |  | 584 |  |  |  |  |  | 5863 |  |  |  | 16 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 18 |
| ${ }_{20}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7271 |  |  |  |  | 19 |
| 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 |
| 2 | 98 | 985 | 98 |  |  | 9848 | 983 | 98 |  | 2 |  |  | 8161 | 8227 |  | 8361 |  |  | 8562 |  | 3 |
|  | 98. |  |  |  |  | 98 | 98 | 9836 | 9834 |  | 376 | 84 | 85 | 8585 |  | 872 |  |  |  |  | 24 |
| 25 | 98 | 984 | 9843 |  | 9837 | 9835 | 9832 | 982 | 982 | 24 | 725 | 87 | 88 | 89 | 9016 | 9088 | 9161 | 9234 | 9306 |  | 5 |
| 26 | 984 | 9839 | 198 | 9834 |  | 9828 | 9825 | 981 |  | 25.981 | 074 | 9149 | 9225 | 1 | 9376 | 9452 | ${ }^{9527}$ | 9603 | 9679 |  | 26 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 29 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 | 1987 | ${ }_{98}^{98}$ | 9805 | 9802 |  |  | $\left\lvert\, \begin{aligned} & 974 \\ & 97 \end{aligned}\right.$ |  | 9785 |  |  |  |  | $\begin{aligned} & 1889 \\ & 1447 \end{aligned}$ |  |  |  |  |  |  |  |
|  | 979 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3 |
|  | 979 | 97 |  |  |  |  |  |  |  | 33.97 |  | 1 |  |  |  |  |  |  |  |  |  |
| 35 | 97 | 97 | 9780 | 9776 | 9772 |  |  |  | 9757 | 34:9754 | 1.2215 | 23 | 2418 |  |  | 2724 |  |  | 3029 |  |  |
| 36 | 97 | 977 | 9773 |  |  |  |  | 9754 |  |  | 125 |  |  |  |  |  |  |  | 3401 |  |  |
|  |  | 97 |  |  |  |  |  |  |  | 36.97 |  |  |  | 3235 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 37 | $1 \cdot 32$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 97 | 97 | 9748 | 9744 |  |  |  |  | 9723 | 39.97 | $1 \cdot 3$ |  | 419 |  |  |  |  | 4774 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 3973 | 97 | 97 | 9725 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 46 | ${ }^{6} 972$ | 97 | 9710 | 9706 | 9701 | 9696 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 48 |
|  |  |  |  |  |  |  |  |  |  | 48 |  |  |  |  | 767 |  |  |  |  |  | 48 |
| 50 | 969 | 96 |  |  | 9675 | 9670 | 9664 | 9659 | 96 | 49 | 1745 | 759 | 7740 | 788 | 803 | 817 | 832 | 84 | 86 |  |  |
| 5 | 968 | 96 | 9679 | 9674 |  | 96 |  | 9652 | 9647 | 50.9 | 177 | 7947 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 96 |  | 964 | 96 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 54 | 967 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 | 96 |  |  |  |  |  |  |  |  |  |  | 9355 | 9514 |  |  |  |  |  | 0474 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 96 | 96 |  | 963 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 59 |
| 59 60 |  |  |  |  |  |  |  |  |  | 58.9585 59.9578 |  |  |  |  |  |  |  |  |  |  | 59 |
|  | 9628 | 196 | 9616 | 9610 |  | 95 |  | 9584 | \|9577 | '95 | 12 | 146 | 1 | 1821 |  |  |  | 230 |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 61.95 | 2.1638 | 1818 |  | 217 | 23 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 62.95 |  |  | 235 |  |  |  |  |  |  |  | 63 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 65 | 5960 |  | 959 | 958 |  |  |  | 9557 |  | 64 | $2 \cdot 26$ | 2874 | 3063 |  |  |  |  |  | 4196 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 95 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 895 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 9524 | 9516 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 39555 |  | 95 | 933 | 95 | 951 | 9510 | 95 | 94 | 7 | 2587 |  | 59 | 6 | 635 | 65 | 675 | 693 |  |  |  |
| 74 | 449549 |  |  | 9526 |  | 951 |  |  | 94 | $73 \cdot 94$ |  |  | 625 | 6471 | 66 | 690 |  | 7331 |  |  | 74 |
| 75 | 5954 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 695 |  |  |  | \|9506 | 9498 |  |  |  |  |  |  | 696 |  |  |  |  | 8070 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 78 |
| 80 | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 79 |
|  | 19507 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 39494 |  |  |  |  | 9451 | 9443 |  |  |  |  |  | 941 |  | 993 | , |  | 06 |  | 138 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 | 59482 | 94 | 9465 | 945 | 9447 | 9438 | 9429 | 9420 |  | 8494 | 2.960 | 991 | 15 | 10406 | 065 | 090 | 114 | 139 | 164 | 18 |  |
|  |  |  |  | ${ }^{9450}$ | 9441 | 9432 | 9422 | 94 | ${ }^{9404}$ | 85 | 3.0014 | 0264 | 051 | 0764 | 1014 | 126 | 151 |  |  |  |  |
|  | 947 | 9461 |  | 9443 |  |  |  |  |  | 86.938 | 3.036 | 0615 | 0868 | 11 | 13 |  |  |  |  |  |  |
|  | 389464 | 9455 |  | 9437 |  |  |  |  | 9390 | 87.930 | 3.0 | 09 | 122 | 1479 | 173 |  |  |  | 2758 |  | 88 |
|  | 9452 |  | 9433 | 9424 | 9415 | 9405 | 9396 | 9386 | 9376 | 88.937 89.936 | 3.1060 3.1410 | 1319 | 1578 193 | 1837 |  |  |  |  |  |  |  |
|  | 944 |  |  | 9418 |  | 9398 | 9389 | 93 |  |  |  | 20 | 22 | 2552 |  |  |  |  |  |  |  |
|  | 9440 | 9430 |  |  |  |  |  | 9372 |  | 11.93 | 21 |  |  |  | 317 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 92.93 | 3.24 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 95 | 59421 | 9412 | 9402 |  |  | 9372 | 9362 | 9352 | 9342 | 94.933 | $3 \cdot 3155$ | 34 | 3707 | 3983 | 4259 | 4535 | 4812 | 5088 | 5364 | 5640 | 95 |
|  |  |  | 9396 | \|9386 |  | 9365 |  | 9345 | 9335 |  | 3.350 | 37 | 62 | 4341 | 4620 |  | 5178 | 5457 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 100 | -0 9391 | 9381 | 9370 | 9360 | 9350 | 1933 | 9328 | ${ }_{9318}^{9325}$ | 9307 | 99.929 | 3.4551 <br> 3.4900 | 5190 | 5726 | 5772 | 6062 | 6353 | 6644 | 6934 | 7225 | 7516 |  |
|  | 60' | 59 | 58 | 57 | $56^{\prime}$ | 55 | 54 | $53^{\prime}$ |  | ${ }^{51}$ |  |  |  | ${ }^{57} 7^{\prime}$ | 56' | 55 |  |  |  | $51^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

|  | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $2^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 21 | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | 26 | $27^{\prime}$ | $28^{\prime}$ | 29 | $20^{\prime}$ | $21^{\prime}$ | $22^{\prime}$ | $2{ }^{\prime}$ | 24 |  | 26 |  | $28^{\prime}$ | 29 |  |
|  | 19992 | 999 | 99 | 999 | 99 | 993 | 9991 | 9991 | 9991 | ． 999 | 0407 | 0410 | 0413 | 0416 | 0419 | 22 | 0425 | 0427 | 0430 |  |  |
|  |  | 998 | 99 | 99 |  |  |  |  |  |  |  |  | $1123$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 1640 | 1652 |  | 1675 | 1687 | 1698 | 82 |  |  |  |
|  | 59959 |  |  |  |  |  |  | 9954 | 9954 | $4 \cdot 9$ | 2036 | 2050 | 2065 | 2079 | 2094 | 2108 | 2123 | 2137 | 2152 |  |  |
|  | 6 | 9950 | 9949 | 9948 | 9947 | 9947 | 9946 | 945 | 944 | 5.994 | 4 | 246 | 247 | 249 | 2513 | 253 | 2547 | 2565 | 25 | 260 |  |
|  |  | 994 |  |  |  |  |  |  | 993 | $6 \cdot 9$ | 850 | 287 | 289 | 291 | 31 | 2952 | 2972 | 2992 | 3013 | 3033 |  |
|  |  | 993 | 9932 | 99 | 99 |  |  |  | 99 | 7.9 | 3257 | 3280 | 3304 | 3327 | 50 | 73 | 97 | 3420 | 3443 | 3466 |  |
|  |  | 99 | 9923 |  |  |  |  |  | 9917 | 8．991 | 3664 | 36 | 3716 | 37 | 3769 | 3795 | 3821 | 3847 | 3873 |  |  |
|  | 9917 | 9916 | 9915 | 9914 | 9121 | 99 | ， | 990 | 9907 | 990 | 4071 | 4100 | 412 | 4159 | 4188 | 4217 | 4246 | 4275 | 430 | 433 | 0 |
| 11 | 99 | 9907 | 996 | 9905 | 9904 | 9902 | 99 | 9899 | 9898 | $10^{\circ}$ | 478 | 4510 | 4542 | 4574 | 4606 | 4638 | 467 | 470 |  |  | 1 |
|  |  | 98 | 9898 | 98 | 98 | 9893 | 98 |  | 98 | 11.98 | 4886 | 49 |  | 0 |  |  | 5095 | 5130 |  |  | 2 |
|  |  | 98 |  | 988 | 98 |  | 98 |  | 9880 | 12 | 5293 | 5330 | 53 | 5406 | 44 | 482 | 5519 | 555 | 559 |  | 3 |
| 14 |  |  |  | 98 |  |  | 9874 |  |  |  |  |  |  |  |  |  | 5944 | 598 | 602 |  | 14 |
|  | 5987 |  | 9872 |  |  |  |  |  |  | 14.985 |  |  |  |  | 6281 | 6325 | 6369 | 6412 | 6456 |  |  |
|  | 98 | 98 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 6840 |  |  | 6 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 17 |
| 18 | 9851 | 984 |  | 9844 | 98 |  | 983 | 9835 | 9833 | $17 \cdot 98$ | 7328 | 73 | 7433 | 7485 | 7538 | 759 | 7642 | 7695 | 774 |  | 18 |
|  | 9842 | 984 | 9838 |  |  |  |  |  |  | 18 | 7735 | 7791 | 7846 | 79 | 56 | 1 | 8067 | 8122 | 8177 | 823 | 9 |
|  | 9834 | 983 |  | 982 | 9825 | 9822 | 820 | 析 | 9815 | 19.9812 | 143 | 8201 | 82 | 8317 | 8375 | 8433 | 8491 | 85 | 8608 |  | 20 |
| 21 | 9826 | 9823 | ${ }^{9821}$ | 9818 | 16 | 9813 | 981 | 980 | 9805 | 20.98 | 3550 | 861 | 8672 | 87 | 8794 | 385 | 891 | 897 |  |  | 21 |
|  | 9818 | 981 | 9812 | 98 |  |  |  |  | 9796 | 21.97 |  |  |  |  | 13 |  | 9341 | 9404 |  |  | 22 |
|  | 9809 | 987 |  |  | 97 |  |  |  | 9787 | $22 \cdot 97$ | ＇9364 | 94 |  |  | 9631 | 969 |  |  |  |  | 23 |
|  | 98 | 979 |  |  |  |  |  |  |  |  |  | 18 |  |  |  | 01 | 019 |  |  |  | 24 |
| 25 | 979 | 979 | 978 | 9784 | 9781 | 9778 | 9775 | 9771 | 9768 | 24 | 1.0178 | 025 | 0324 | 0396 |  | 0542 | 0614 |  |  |  | 25 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 27 |
|  | 9768 | 97 |  |  |  |  |  |  |  |  |  | 14 |  | 16 | 1725 | 1807 | 188 | 19 | 20 |  | 28 |
| 29 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 29 |
| $\frac{30}{31}$ | 97 |  |  |  |  |  |  |  |  |  |  | 2301 |  | 2476 | 2563 |  | 2737 | 2824 |  |  | 30 |
| 31 <br> 32 | 974 | 97 | 9736 | 97 | 9728 | 9724 | 9720 |  | 9713 | 3 | 22 | 271 | 280 | 289 | 298 | 307 | 315 | 325 |  |  | 31 |
|  |  | 973 |  |  |  |  |  |  |  | 31.96 |  | 3121 |  |  | 0 | 3493 |  |  |  |  | 32 |
|  | 9726 | 97 | 9719 | 97 |  |  | 9702 |  |  | 32.9 | 1.343 | 35 | 36 | 3723 | 19 | 3915 | 401 | 4107 | 42 |  | 33 |
|  |  | 97 |  |  |  |  |  |  |  | 33．96 | 1.38 |  | 40 | 413 | 4238 | 433 | 443 | 453 |  |  | 34 |
| 35 | 971 | 970 | 9701 | 96 | 96 | 9689 | 9684 | 968 | 9676 | 34．967 | $1 \cdot 42$ | 43 | 445 | 45 | 4656 | 475 | 486 |  | 50 | 51 | 35 |
|  | 97 | ${ }_{9699}^{969}$ | 9693 | 9689 | 9684 | 9680 | 967 |  |  | ${ }^{35.961}$ |  | 476 |  |  |  |  |  |  |  |  | ${ }^{6}$ |
|  |  | 968 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 37 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 61 |  |  |  | 38 |
| $\begin{aligned} & 39 \\ & 40 \end{aligned}$ | 96 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 99 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4 |
|  |  | 96 |  | 963 | 9632 |  | 962 |  |  |  |  |  | 7344 |  |  |  |  |  |  |  | 42 |
|  | 96 | 96 | 9633 | 9628 | 9623 |  |  |  |  |  |  |  |  |  |  | d 35 | 8256 |  |  |  | 3 |
|  |  | 96 |  |  |  |  |  |  |  | 43.957 | 17914 |  |  |  | 8425 | 855 |  |  |  |  |  |
| 45 | 5962 | 962 | 9616 | 9611 | 9605 | 9600 | 9594 | 9589 | 95 | $44^{4.957}$ | 1．8321 | 84 | 858 | 87 | 88 | 897 | 91 | 92 | 93 |  | 45 |
| 46 | 961 | 9613 | 96 | ${ }_{9502}^{9602}$ | 9596 | 95 | 19 | 958 | 9574 | 44．95 | 1. | 88 | 89 |  | 926 | 939 | 953 |  |  |  | 46 |
|  | 96 | 96 |  |  |  | 95 |  |  |  | 46．9 |  |  |  |  |  |  |  |  |  |  | 47 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 95 | 95 |  |  | 95 |  |  | 9543 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 95 | 957 | 9565 | 9559 | 95 | 9546 | 195 |  |  | 50.95 |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 95 |  |  | 95 |  |  |  | 95 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 25 | 95 | 95 | 953 | 95 | 9529 | 95 | 951 | 950 |  |  |  |  |  | 2194 | 234 | 25 | 26 |  |  | 53 |
|  |  | 95 |  |  |  |  |  |  |  |  |  |  |  | 2456 | 2613 |  |  |  |  |  | 54 |
| 55 | 5954 | 95 | 9531 |  |  |  | 9504 | 9497 | 949 | 54.948 | 2．239 | 255 | 271 | 287 | 3032 | 319 | 3351 | 3511 | 3671 | 3831 | 55 |
| $\begin{aligned} & 56 \\ & 57 \end{aligned}$ |  |  |  |  |  |  | 9495 | 948 | 9481 |  |  | 29 | 31 | 32 | 3450 | 361 | 377 | 393 |  |  | 56 |
| 55 | 95 | 95 |  |  | 95 |  | 9486 | 9479 | 9472 |  |  |  |  |  |  | 403 | 420 |  | 㖪 |  |  |
|  | 95 |  |  |  |  |  |  |  |  | 5 |  | 378 | 析 | 41 | 4288 | 4， | 5 | 5 | 538 |  | 58 |
|  |  |  |  |  |  |  | 9468 | 析 | 9453 |  | 2402 | 419 | 436 | 45 | 418 | 487 | 505 | 52 | 53 |  |  |
| 60 | 950 | 9495 | 9488 | 9481 | 9474 | 66 | 9459 | 9452 | 9444 | 59．943 | 2.4428 | 4602 | 477 | 495 | 5125 | 530 | 547 | 564 | 58 |  | 60 |
|  | 9494 | 9487 | ${ }^{9480}$ | 9472 | 9465 | 9457 | 9450 | 944 | 9435 |  | 2.4835 | 5018 |  |  |  |  | 589 | 60 | 6253 |  |  |
|  |  |  |  | 94 | 94 | 9449 | 9441 | 943 | 942 | 61．941 | 2.5 | 54 | 56 |  |  | 614 | 632 | 656 |  |  |  |
|  | 948 |  | 946 | 94 | 94 | 9440 | 9432 | 942 | 941 |  |  |  |  |  |  |  | 674 | 693 | 71 | 729 | 63 |
| 64 65 |  |  | 9454 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 735 |  |  |  |
| 65 | 946 | 94 |  | 94 | 9430 | 2 | 9414 | 9406 | 9398 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 942 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 94 | 94 |  | 93 | 9388 | 937 |  | $2 \cdot 7$ | 74 |  |  |  |  |  |  |  |  |  |
| 68 |  | 94 |  | 9412 | 9404 |  | 9387 | 9378 | 9370 |  |  |  |  |  | 8475 | 析 | 925 | 906 |  |  | 8 |
| 79 |  |  |  |  |  |  |  |  |  |  |  | 8293 | － | 8 | －313 | 951 | 9295 | 㖪 | ， |  | 69 |
| $\frac{7}{7}$ | ， | 9 | 速 | 9395 | 9386 | 9377 | 保 | 9360 | 9351 | 69.934 | 2.8499 | 8703 | 8906 | 9110 | 931 | 951 | 9720 | 9923 | 12 | 0330 | 0 |
| 7 | 94 | 940 | 93 | ${ }^{9386}$ | 9377 | ${ }^{9369}$ | 19360 | 9351 | ${ }^{9342}$ | 70.9 | 289 | 15 | 93 | 95 | 9732 |  |  | 0351 |  |  | 71 |
|  |  |  |  | 93 |  |  | 9351 | 9342 | 9333 | 72 | 2.931 | 952 | 973 | 935 | ＋15 | 036 | 0569 | ， | 098 |  |  |
| 73 | 939 |  |  | 93 | 93 | 93 | 93 | 933 | 932 | 72.93 | 2.972 | 993 | 1 | 03 |  | 07 | 09 | 12 | 141 |  |  |
| 74 75 7 | 938 |  |  |  | 93 |  | 93 | 93 | 931 | 73.9 |  | 034 |  |  |  | 120 | 141 | 163 |  |  | 74 |
|  | 5 |  |  |  |  |  | 9324 |  |  |  | 3.0 |  |  | 118 |  | 162 | 1843 |  |  |  | 75 |
|  | 938 |  | 9352 | 93 | 析 |  |  | 9305 | 92 |  |  | 11 |  |  |  |  | 2267 |  |  |  |  |
|  | 93 | 93 |  | 93 | 93 |  |  |  | 928 |  |  |  |  |  |  |  |  | 29 | 31 |  |  |
|  | ${ }_{934} 933$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 析 |
| 80 | 933 | ${ }_{932}$ | 93 | 93 | 92 | 9288 | 9278 |  |  |  |  |  |  |  |  | 3711 | 3541 | 4798 | 4000 |  | 89 |
|  | 1932 | 931 | 93 | 92 | 9289 | 92 | 9270 |  |  |  |  |  |  |  |  |  |  |  |  |  | 81 |
|  |  | 931 | 93 | 92 | 92 | 9271 | 9261 |  | 924 |  |  | 362 |  |  |  |  |  |  |  |  | 2 |
| ${ }_{8}^{83}$ |  | 93 | 9292 | ${ }_{9282}^{9273}$ | 9272 |  | ${ }_{9252}^{925}$ | 9241 | 9231 | 82.9221 83.921 | 3.3792 3 | 4033 | 4274 | 451 | 4757 | 4998 | 5239 | 5480 | 52 |  | 83 |
| 84 <br> 85 <br> 8 |  |  | 9283 |  |  |  |  |  |  |  |  | 4443 |  | 493 | 5176 | 5420 |  |  |  |  | 84 |
| 85 |  |  |  |  |  |  | 9234 | 9223 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 92 |  |  |  |  |  | ${ }^{9225}$ | 9214 | 920 | 85.91 | 3.5013 | 5263 | 551 | 576 |  | 626 | 6513 | 76 |  |  | ${ }^{86}$ |
|  |  |  |  | 923 | 92 | 9217 | 9207 | 9196 | 918 | ${ }^{8691917}$ | 3.54 <br> 3.58 | ${ }^{5673}$ | 633 | 659 | 68 |  |  |  |  |  |  |
|  |  |  |  | 9230 |  |  | 9197 | 186 | 9 | 88.916 | 3.623 | 649 |  |  |  |  |  |  |  |  | 888 |
| 90 | 9254 | 9243 | 9232 | 9222 | 9211 | 9200 | 9188 | 9177 | 9166 | 89.915 | 3.661 | 690 | 716 | 742 | 7688 | 7950 | 8211 | 84 | 8734 |  |  |
|  | 92 | 92 | 9224 | 9213 | 9202 | 918 | 9179 | 9168 | 析 |  | 3．745 | 7313 | 75 | 782 |  |  |  |  |  |  |  |
|  | 923 | 922 | 9215 |  | 9193 | 91 | 9170 | 9159 | 914 | 91.91 | 3.745 | 7723 | 798 | 825 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 8133 | 840 | － |  | 9 |  |  |  |  |  |
|  | 92 | 920 |  | 917 | 9167 | 91 | 9143 | 9132 |  |  |  |  |  |  |  |  |  | 188 |  |  | 94 |
|  | 920 | 919 |  | 9170 |  |  | 91 | 9122 | 9110 |  |  | 9364 | 9643 | 992 |  |  |  |  |  |  |  |
|  | 9196 | 918 |  |  |  | 9137 | 9125 |  |  |  |  | 174 | － |  | ． | 99 | 118 | 146 |  |  | 97 |
|  |  |  |  |  |  |  |  |  |  |  | 3.98 | ＊18 | 046 | 075 | 103 | 13 | 1608 |  |  |  | 98 |
|  | 1171 | 915 | 9147 | 9135 | 9123 | 9111 | 098 | 9086 | 9073 | 99.906 | 4.0306 4.0713 | 10594 | 294 | ${ }_{1585}^{1169}$ | 1457 1876 | 1745 | 2457 | 2748 | 3038 | 2896 | 99 |
|  | 40＇ | 39 | $38^{\prime}$ | 37 | 36＇ | 35＇ | 34＇ | 3 | $32^{\prime}$ | $31^{\prime}$ |  |  |  |  | 36 | 35 |  |  |  | 31 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

|  | Cosini |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $2^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\prime}$ | $4{ }^{1}$ | 42＇ | 43 | 44＇ | 45 |  |  | 48 |  | 40 | 41 |  | 43 | 44 ${ }^{\text { }}$ |  |  |  |  |  |  |
|  |  |  |  | 9989 |  |  |  |  |  |  |  |  | 0471 | 0474 | ${ }^{0477}$ | 0 |  |  | 88 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0954 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 188 | 1404 |  | 1822 |  |  |  | ${ }_{1}^{1457} 1$ | 1465 |  |  |
| 5 |  |  |  |  |  | 994 | 9942 |  | 9940 | 4.994 | ${ }_{2} 236$ | 1841 | 1884 <br> 235 | ${ }_{1}^{1896}$ | 2384 | 1239 |  | 1942 | 1954 |  |  |
| 6 | 9935 | 9934 | 9933 | 9933 |  | 9931 | 9930 | 9929 | 9928 | 5．992 | 279 |  | 2826 | ${ }^{2844}$ | 2861 | 79 | 2896 | 2914 | 2931 | 2948 |  |
|  | 992 | 992 |  |  |  | 9919 | 9918 | 9917 | 99 | 仡 | 325 | 327 |  | 18 | 38 | 888 | 3379 |  |  |  |  |
|  | 9913 | 9912 | 9911 |  |  |  | 9907 |  | 99 | 7.99 | 372 | 37 | 3721 |  | 3815 | 3838 | 3861 |  |  |  |  |
|  | 990 |  |  |  |  |  |  |  |  |  | 4187 | 42 |  |  |  | 4318 |  |  |  |  |  |
|  | 9892 | 9890 | 9889 | 9888 | 9886 | 9885 | 9883 | 9882 | 9881 | 9.987 | 653 |  | 4711 |  | 4769 |  |  |  |  |  |  |
| 11 | 9881 | 9879 | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9870 | 986 |  |  | 9863 | 9862 |  |  | 9857 | 11.98 |  | 56 |  |  |  | 575 |  |  |  |  |  |
|  | 9859 | 985 | 9856 |  | 9852 | 9850 | 9848 |  | 98 |  |  | 608 | 61 |  | 619 | 6237 | 6275 | 63 | 63 | 63 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 6676 |  |  |  |  |  |  |
| 15 | 983 | 98 |  |  |  |  |  |  |  |  |  |  |  |  | 7153 |  |  |  |  |  |  |
|  |  | 98 |  |  | 9818 | 9816 | 9814 |  |  |  |  |  | 7537 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8057 | 8107 | 8156 |  | 8255 | 830 |  |  |
|  | 9805 | 98 |  | 979 | 9795 | 9793 | 97 | 978 | 9785 | 1 |  | 842 | 8479 | 8531 | 8584 | 8636 | 8688 |  |  | 8845 |  |
|  | 979 | 97 |  |  |  |  | 9779 |  | 97 | 18.977 | 8840 |  | 8950 |  |  |  |  |  |  |  |  |
| 20 | 9783 | 978 | 9778 |  | 9712 | 硣 | 976） | 9764 | 9761 | 19．975 | 305 | 9363 | 9421 | 947 | 53 | 959 | 65 | 971 | 977 |  | 20 |
| 21 | 9773 | 9770 | 9767 | 9764 | 9761 | 19758 | 9755 | 975 | 9749 | 20.974 | ＇9770 | 983 | 989 | 995 | 01 | 007 | 01 |  |  |  | 21 |
| $22$ |  | 975 | 9756 | 9753 | 9750 | 9747 | 9744 | 9740 | 9737 | 21．973 | 1.0236 | 02 | 0363 | 04 |  | 0555 |  |  |  |  |  |
| $23$ | 975 | 974 | 9745 |  | 97 |  | 9732 |  | 972 | 22 | 1.070 | 07 | 08 |  | 0968 | 103 | 110 |  |  |  |  |
| 2 |  | 973 |  |  |  |  |  |  |  |  |  |  |  | 13 | 14 |  |  |  |  |  | 24 |
| 25 | 97 | 972 | 19722 | 9719 | 97 | 9712 | 970 |  |  |  |  |  | 177 | 184 | 19 |  |  |  |  |  |  |
| 26 | 97 | 971 | ｜9711 |  | 9704 |  |  |  |  | 25.96 | $1 \cdot 20$ |  |  |  |  | 12474 | 2550 | 2625 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 28 \\ & 0 \end{aligned}$ | 96 | 96 |  |  |  |  |  |  |  |  |  |  |  |  | 3353 |  | 3515 |  |  |  |  |
| ${ }^{29}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 |  | 96 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 965 | 96 |  |  | 96 | 96 | 9627 |  | 96 | 31.96 |  |  |  |  |  | 535 |  |  |  |  |  |
| 3. | 96 | 963 | 96 |  | 9625 | 96 | 9615 | 9611 | 960 | 32．960 | 1.535 | 54 | 55 |  |  | 583 |  |  |  |  |  |
|  |  |  |  |  |  |  | 96 | 9599 | 959 | 33．958 |  |  |  |  |  | 63 | 641 |  |  |  |  |
| 35 |  |  |  |  |  |  |  |  |  |  | 1.6284 |  | 648 |  | 6691 | 679 | 6894 |  | 70 |  | 35 |
| 36 | 96 | 96 | 9600 | 9595 | 9590 | 95 | 95 | 95 | 9570 | 35.9 | $1 \cdot 6$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 957 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 95 | $\begin{aligned} & 957 \\ & \hline 056 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| － |  | 9550 | 954 |  | 9534 | 9528 | 952 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 978 |  |  |  | 0273 | 03 |  |  |  |
|  | 95 | 951 | 95 | 95 | 95 | 9505 |  | 9493 | 948 |  |  | － |  | －3 |  | 063 | 0756 | 088 |  |  |  |
| 44 |  | 9518 |  |  |  | 94 | 9487 |  |  |  |  |  | 0727 | 08 |  | 111 | 123 | 136 | 1494 |  |  |
| 4 | 9513 | 950 |  | 9494 | 94 | 94 | 9475 | 946 | 946 | 44 | 2.093 | 106 | 11 | 13 | 1459 | 159 | 172 |  | 1982 | 21 |  |
| 46 | 9502 | 949 | 948 | 9483 | 94 | 9470 | ｜9464 | 945 | ｜945 | $45^{\circ} 9$ | 2．140 | 153 | 1689 |  |  | 207 | 220 | 23 |  |  |  |
| 47 | 9 | 94 | 9478 |  | 94 | 94 | 9452 | 94 | 927 | 46．933 | ， | 2 | 21. | 227 |  |  | 2686 | 28 |  |  |  |
| 48 | 948 | 947 | 946 | 946 | 94 | 944 | 9441 | 94 | 942 | 47．942 | $2 \cdot 2332$ | 247 | 26 |  |  |  |  |  |  |  | 48 |
|  |  |  |  |  |  |  |  |  | 941 |  |  |  | 30 |  |  |  |  |  |  |  | 49 |
| 50 | 945 |  | 944 | 94 | 9431 | 9424 | 9417 | 9410 | 9403 | 49 | 2 | 13408 | 359 | 36 |  | 3989 | 4134 | 4280 | 4425 |  |  |
| 51 |  |  |  |  | 94 | ¢ | 位 |  |  |  |  |  |  |  |  |  | 4617 |  |  |  |  |
|  | 9437 |  |  |  | 94 |  | 9394 | 93 |  |  |  | 43 | 449 | 46 |  |  | 517 |  |  |  |  |
| $\begin{aligned} & 53 \\ & 54 \end{aligned}$ | 9426 | 94 | 94 | 94 |  |  | 9382 | 937 | ${ }^{936}$ |  |  | 4812 |  |  | 527 |  | 558 | 573 |  |  | 53 |
| 55 | 9404 | 939 | 938 | 938 | 9374 | 9367 | 9359 |  |  |  | 2. |  |  |  |  |  |  | $6708$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 627 | ， | 654 |  | 686 | 7 | 719 | 735 |  | 56 |
| $57$ | 9383 | 93 | 93 | 93 | 93 |  | 9336 | 9328 |  |  |  | 668 | 685 |  |  |  |  |  |  |  |  |
| 58 | 93 | 93 |  | 93 |  |  | 9324 | 93 | 9308 |  | 2．69 | 75 | 73 | 70 |  |  |  | 816 | 83 |  |  |
| 5 |  |  |  |  | 93 | 9321 | 9312 |  |  | 58.92 | 2.74 | 762 | 779 | 79 | 81 | 830 | － | 86 |  |  | 59 |
| 60 | 93 | 9342 | 9334 | 9326 | 9317 | 93 | 9301 | 929 | 9284 | 59 | 2.791 | 809 | 826 | 843 | 861 | 878 | 896 | 913 | 931 | 948 | 60 |
| 61 | ${ }^{9339}$ | 9331 | ${ }^{9323}$ | 9314 | 930 | ${ }^{9298}$ | 9289 | 19280 | 220 | 60．92 | 2.83 |  |  | 89 |  |  |  |  | 9798 |  |  |
|  | 93 | 93 | 93 |  | 92 | 92 | 92 | 92 | 92 | 61.92 | 2.88 |  | 920 | 93 | 95 |  |  |  |  |  |  |
|  |  |  |  |  |  | 92 | 92 | 925 |  | $62 \cdot 9$ | $2 \cdot 93$ |  | 967 | 986 | 10 |  |  |  |  |  | 63 |
| $64$ | 938 |  | 硡 |  |  | 92 | 92 | 92 | 9236 |  |  |  | －14 | 033 |  |  |  |  | 12 | 14 |  |
| 65 | 923 | 928 | 92 | 92 | 92 | 92 | 92 | 92 |  |  | 3. | 0430 |  |  |  | 1186 | 1375 |  |  |  |  |
|  | 92 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 3.1 | 136 | 15 | 175 | 19 | 1 |  | 253 |  |  |  |
| 68 | 9264 |  |  | 92 |  |  |  | 9198 | 91 |  | 3．16 | 183 | 25 | 22 | 24 | 262 | 282 | 302 | 3218 |  | 58 |
| 70 | 924 | 923 | 92 | 22 | 9204 | 91 | ） | 917 |  | 68 |  | 2771 |  |  |  |  |  |  |  |  | 析 |
|  | 9231 | 92 |  | 9202 | 91 | 918 | 9172 | 9162 | 9152 | $70 \cdot 91$ | 3．303 | 323 | 344 | 36 | 3859 | 406 |  |  |  |  | 71 |
| 72 | 922 |  | 硡 |  | 9181 |  |  | 9151 | 9140 |  | 3．34 | 3727 | 391 | 412 | 43 | 45 | 47 |  |  |  |  |
|  | 920 | 9200 |  | 9180 | 9169 | 9159 | 9149 | 9139 | 9128 | 72.91 | 3 <br> 3 <br> 3 <br> 3 | 4176 | 438 | 460 | 48 | 55 |  |  |  |  | 73 |
| 74 | 919 |  |  |  | 915 | 9148 | 9137 | 9127 | 9117 |  | 3.442 | 46 | 485 | 507 |  |  |  |  |  |  | 74 |
| －75 | 918 | 91 | 91 | 9157 | 914 | 9136 | 9126 | 9115 | 910 |  | －3489 | 5113 |  | 55 | 576 | 59 |  |  |  |  | 5 |
| 76 | 917 | 91 | 9156 | 9 | 91 | 析 | 1 |  | 90 |  | 3． | 5580 | 58 |  |  |  |  |  |  |  |  |
|  | 916 | 91 | 9145 |  | 91 |  |  |  | 90 |  | 3．58 |  | 627 | 649 | 67 |  |  | 73 |  |  | 77 |
| 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 78 |
| $\begin{array}{r}78 \\ 80 \\ \hline\end{array}$ | 913 | 9123 | 9112 | 91 |  | 90 | 90 | 90 | 仡 |  |  | 745 |  |  |  |  |  |  |  |  | 79 <br> 80 |
|  | 91 |  |  |  |  |  | 90 |  |  |  |  |  |  |  |  |  |  | 93 |  |  | 81 |
|  |  |  | 909 |  |  |  |  |  |  |  |  |  |  |  | 910 |  | 958 | 98 | －05 |  | 82 |
|  | 9101 | 90 | 9079 | 9067 | 9056 | 90 | 903 |  |  | 82 | 3.86 |  |  |  |  | 982 | 054 |  | O54 |  |  |
| 88 | 9080 |  | 9056 |  |  | 90 | 90 |  | 8985 | $83 \cdot 89$ <br> 84.89 | 3．908 | 9794 | ． 04 | ${ }^{981}$ | 053 | －030 |  |  |  |  | 84 8 |
| 86 | 9069 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  |  |  |  |
|  | 903 | 9046 | 903 | 号 | 901 |  | 89 |  | 8 |  | 4 | 13 | － | 1235 | 148 | 172 | 199 | 22 |  |  |  |
| 88 | 9047 | 9035 | 9023 | 901 | 8999 | 898 | 89 | 89 | 89 | 87.8 | 4.09 | 119 | 1454 | 170 | 19 | 222 | 24 | 273 |  |  | 38 |
| 89 90 | 3025 | 9013 | 9001 | 8988 | 8976 | 8964 | ${ }_{8951}^{8963}$ | ${ }_{8938}^{8950}$ | ${ }_{8925}^{8937}$ | ${ }_{88}^{88.89}$ | 4．1873 | 1666 2134 | 192 | 265 |  |  |  |  |  |  |  |
| 91 | 9015 | 9002 | 8990 | 89 | 8965 | － | 89 | 8926 | 89 |  | 2 | 26 | 28 | 313 | 359 | 360 | 39 |  |  |  |  |
|  | 9004 | 89 | 89 |  |  |  |  |  |  |  |  |  |  |  | 387 | 414 | 44 | 467 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 94 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 95 | 897 | 8958 | 89 | 8932 | 8919 |  | 8893 | 88 | 886 | $94 \cdot 88$ | $4 \cdot 419$ | 4475 | 4751 | 5027 | 5303 | 5579 | 5855 | 613 | 640 | 668 |  |
|  | 96 | 89 |  |  | 8908 |  | ${ }^{888}$ |  | ${ }^{885}$ |  |  |  | 5222 |  | 5780 | 6059 | 633 | 66 |  |  | ${ }^{6}$ |
| $97$ | 89 |  |  |  |  |  |  |  |  |  |  |  | ${ }_{616}^{569}$ |  | 625 673 | 7039 | ${ }_{7303}^{682}$ | 758 | 787 |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 450 | 581 |  | 64 |  |  |  |  |  |  |  |
| 100 | 8917 | 8904 | 8890 | 8876 | 8862 | 8848 | 8834 | 8820 | 8806 | 99：8792 | 4.6525 | 6816 | 7107 | 7397 | 7688 | 7978 | 8269 | 8559 | 8850 | 14 | 100 |
|  | $20^{\prime}$ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | $14^{4}$ | 13 | $12^{\prime}$ | $11^{\prime}$ | $20^{\prime}$ | 19 | $18^{\prime}$ | 17 | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ | $13^{1}$ |  | $11^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.

| $3^{\circ}$ | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $3^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | $1^{\prime}$ | $2{ }^{\prime}$ | $3^{\prime}$ | ${ }^{\prime}$ | $5^{\prime}$ | $6^{\prime}$ | 7 | $8^{\prime}$ | 9 | $0^{\prime}$ | ! | $2^{\prime}$ | $3{ }^{\prime}$ | $4^{\prime}$ | $5^{\prime}$ |  | $7{ }^{\prime}$ |  |  |  |
|  | 9986 | 9986 | 9986 | 9986 | 9986 | 9986 | 9985 | 9985 | 9985 | 9985 | 0523 | 26 | 0529 | 0532 | 0535 | 0538 | 05 | 0544 | 0547 | 0550 |  |
|  | 9973 | 9972 | 9972 | 9972 | 9971 | 9971 | 9971 | 9970 | 9970 | 1.9970 | 1047 | 1053 | 1058 | 1064 | 1070 | 1076 | 108 | 1087 | 1093 | 1099 |  |
|  | 9959 | 9958 | 9958 | 9958 | 9957 | 9957 | 9956 | 9956 | 9955 | 2.9955 | 1570 | 1579 | 1588 | 1596 | 1605 | 1614 | 1622 | 1631 | 1640 | 164 |  |
|  | 9945 | 9945 | 9944 | 9943 | 9943 | 9942 | 9941 | 9941 | 9940 | 3.9940 | 2093 | 2105 | 2117 | 2128 | 2140 | 2152 | 21 | 2175 | 2186 | 219 |  |
|  | 9931 | 9931 | 30 | 229 | 992 | 9928 | 9927 | 9926 | 9925 | 4.9924 | 2617 | 2631 | 2646 | 2660 | 2675 | 2689 | 270 | 2718 | 2733 | 74 |  |
| 6 | 9918 | 991 | 16 | 9915 | 9914 | 99 | 9912 | 9911 | 991 | 5.990 | -3140 | 3158 | 317 | 319 | 3210 | 3227 | 324 | 3262 | 3280 | 3297 |  |
|  | 9904 | 9903 | 9902 | 9901 | 9900 | 9899 | 9898 | 9896 | 9895 | 6.9894 | -3664 | 3684 | 3704 | 3725 | 3745 | 3765 | 378 | 3806 | 3826 | 3847 |  |
|  | 9890 | 9889 | 9888 | 9887 | 9885 | 9884 | 9883 | 9882 | 9880 | 7.987 | 4187 | 4210 | 4233 | 4257 | 4280 | 4303 | 43 | 4350 | 4373 | 43 |  |
|  | 9877 | 9875 | 9874 | 9873 | 9871 | 9870 | 9868 | 9867 | 9865 | 8.986 | 4710 | 4736 | 4763 | 4789 | 4815 | 4841 | 486 | 4893 | 4919 | 494 |  |
| 10 | 9863 | 9861 | 9860 | 9858 | 9857 | 9855 | 9854 | 9852 | 9851 | 9.9849 | 5234 | 5263 | 5292 | 5321 | 5350 | 5379 | 5408 | 5437 | 5466 | 5495 | 10 |
| 11 | 9849 | 9848 | 9846 | 9844 | 98 | 984 | 839 | 983 | 9836 | 10.98 | 57 | 5789 | 582 | 5853 | 588 | 5917 | 5949 | 5981 | 6013 | 6045 | 11 |
| 12 | 9836 | 9834 | 9832 | 9830 | 9828 | 9826 | 9824 | 9823 | 9821 | 11.981 | 6280 | 6315 | 6350 | 6385 | 6420 | 6455 | 648 | 6524 | 6559 | 659 | 12 |
| 13 | 9822 | 9820 | 9818 | 9816 | 9814 | 9812 | 9810 | 9808 | 9806 | 12.980 | 6804 | 6841 | 6879 | 6917 | 6955 | 6992 | 7030 | 7068 | 7106 | 714 | 13 |
| 14 | 9808 | 9806 | 9804 | 9802 | 9800 | 9797 | 9795 | 9793 | 9791 | 13.9788 | 7327 | 7368 | 7408 | 7449 | 7490 | 7530 | 75 | 7612 | 7652 | 76 | 14 |
| 15 | 9794 | 9792 | 90 | 9788 | 9785 | 9783 | 9781 | 9778 | 9776 | 14.9773 | 7850 | 7894 | 7938 | 7981 | 8025 | 806 | 811 | 8155 | 8199 | 8243 | 15 |
| 16 | 978 | 97 | 97 | 97 | 9771 | 9768 | 97 | 97 | 976 | 15.975 | 8374 | 8420 | 84 | 851 | 8560 | 8606 | 8653 | 8699 | 874 | 8792 | 16 |
| 17 | 9767 | 9764 | 9762 | 975 | 9757 | 9754 | 9751 | 9749 | 9746 | 16.9743 | 3897 | 8946 | 89 | 90 | 9095 | 9144 | 919 | 9243 | 9292 | 93 | 17 |
| 18 | 9753 | 9751 | 9748 | 9745 | 974 | 9739 | 9737 | 9734 | 9731 | $17 \cdot 9728$ | 20 | 947 | 95 | 9577 | 963 | 96 | 97 | 9786 | 9839 | 98 | 18 |
| 19 | 9740 | 9737 | 9734 | 9731 | 9728 | 9725 | 9722 | 9719 | 9716 | 18.9713 | -9944 | 99 | -054 | 0109 | 0165 | 022 | 027 | 0330 | 038 | 04 | 19 |
| 20 | 9726 | 9723 | 9720 | 9717 | 9714 | 9710 | 9707 | 9704 | 9701 | 19.9698 | 1.0467 | 0525 | 0583 | 0641 | 0700 | 0758 | 0816 | 0874 | 0932 | 099 | 20 |
| 21 | 9712 | 9709 | 06 | 9703 | 9699 | 696 | 9693 | 968 | 9686 | 20.96 | 1.0991 | 1052 | 1113 | 1174 | 1235 | 129 | 1357 | 18 | 1479 |  | 21 |
| 22 | 9698 | 9695 | 9692 | 9688 | 9685 | 9682 | 9678 | 9675 | 9671 | 21.966 | $1 \cdot 1514$ | 1578 | 1642 | 1706 | 1770 | 183 | 189 | 1961 | 202 |  | 2 |
| 23 | 9685 | 9681 | 9678 | 9674 | 9671 | 9667 | 9663 | 9660 | 9656 | 22.965 | $1 \cdot 2037$ | 2104 | 2171 | 2238 | 2305 | 237 | 243 | 2505 | 257 | 26 | 23 |
| 24 | 9671 | 67 | 9664 | 9660 | 9656 | 9653 | 9649 | 9645 | 9641 | 23.9637 | 12561 | 2630 | 2700 | 2770 | 2839 | 290 | 297 | 3049 | 311 | 3188 | 24 |
| 25 | 9657 | 54 | 9650 | 9646 | 9642 | 638 | 9634 | 9630 | 9626 | 24.9622 | $1 \cdot 3084$ | 3157 | 3229 | 3302 | 337 | 344 | 352 | 3592 | 366 | 373 | 25 |
| 26 | 964 | 9640 | 9636 | 963 | 9628 | 9624 | 962 | 96 | 9611 | $25 \cdot 96$ | $1 \cdot 3607$ | 368 | 37 | 3834 | 39 | 39 | 40 | 4136 | 4212 | 428 | 26 |
| 27 | 9630 | 9626 | 9622 | 961 | 9613 | 9609 | 9605 | 9601 | 9596 | $26 \cdot 9$ | 1.4131 | 420 | 428 | 4366 | 4444 | 452 | 460 | 4680 | 4758 | 4837 | 27 |
| 28 | 9616 | 12 |  | 96 | 959 | 9595 | 9590 | 9586 | 9581 | 27.957 | $1 \cdot 4654$ | 473 | 481 | 4898 | 4979 | 506 | 514 | 5223 | 530 | 538 | 28 |
| 29 | 9603 | 9598 | 9594 | 958 | 9585 | 580 | 9576 | 9571 | 9566 | 28.95 | 1.5 | 526 | 53 | 5430 | 5514 | 55 | 568 | 5767 | 585 | 593 | 29 |
| 30 | 9589 | 9584 | 9580 | 9575 | 9570 | 9566 | 9561 | 9556 | 9552 | 29.954 | 1.5701 | 5788 | 5875 | 5962 | 6049 | 6136 | 6224 | 6311 | 6398 | 648 | 30 |
| 31 | 957 | 9570 | 9566 | 956 | 9556 | 9551 | 9546 | 9541 | 9537 | $30 \cdot 9$ | 24 | 6314 | 6404 | 64 | 6584 | 66 | 67 | 54 | 6945 |  | 31 |
| 32 | 9561 | 9557 | 9552 | 9547 | 9542 | 9537 | 9532 | 9527 | 9522 | 31.951 | 1.6748 | 6840 | 6933 | 7026 | 711 | 721 | 7305 | 7398 | 749 | 758 | 32 |
| 33 | 9548 | 9543 | 9538 | 9533 | 9527 | 9522 | 9517 | 9512 | 9507 | 32.95 | 17271 | 7367 | 7463 | 7558 | 7654 | 775 | 7846 | 7942 | 803 | 81 | 33 |
| 34 | 9534 | 29 | 9524 | 9518 | 9513 | 508 | 9502 | 9497 | 9492 | 33.948 | 17794 | 7893 | 7992 | 8091 | 8189 | 828 | 8387 | 848 | 858 | 868 | 34 |
| 35 | 952 | 15 | 10 | 9504 | 9499 | 493 | 9488 | 9482 | 9477 | 34.947 | 18318 | 8419 | 8521 | 8623 | 8724 | 882 | 8928 | 902 | 13 | 923 | 35 |
| 36 | 9507 | O1 | 9496 | 949 | 84 | 9479 | 947 | 9468 | 9462 | 35.945 | 1.8841 | 894 | 9050 | 91 | 925 | 936 | 94 | 9573 | 9677 | 97 | 36 |
| 37 | 949 | 9487 | 9482 | 94 | 70 | 464 | 9459 | 9453 | 9447 | 36.944 | 1.9364 | 947 | 9579 | 96 | 9794 | 9902 | -00 | 0117 | 0224 | 033 | 37 |
| 38 | 9479 | 473 | 9468 | 9462 | 9456 | 55 | 9444 | 9438 | 9432 | 37.942 | 1.9888 | 999 | -108 | 0219 | 0329 | 044 | 0550 | 0660 | 077 | 088 | 38 |
| 39 | 9466 | 9460 | 9454 | 9448 | 9442 | 335 | 9429 | 9423 | 9417 | 38.94 | 2.041 | 052 | 0638 | 0751 | 0864 | 097 | 109 | 1204 | 131 | 14 | 39 |
| 40 | 9452 | 9446 | 9440 | 9433 | 9427 | 21 | 9415 | 08 | 9402 | 39 | 2.0934 | 105 | 116 | 1283 | 1399 | 151 | 1632 | 1748 | 186 | 198 | 40 |
| 41 | 943 | 19432 | 9426 | 9419 | 9413 | 9406 | 9400 | 9394 | 9387 | 40 | 58 | 157 | 1696 | 1815 | 1934 | 2053 | 2172 | 2291 | 2410 |  | 41 |
| 42 | 9424 | 18 | 9412 | 9405 | 9399 | 9392 | 9385 | 9379 | 9372 | 41.936 | 2. 1981 | 2103 | 2225 | 2347 | 2469 | 259 | 2713 | 283 | 295 | 3079 | 42 |
| 43 | 9411 | 404 | 9398 | 9391 | 9384 | 9378 | 9371 | 9364 | 9357 | 42.935 | $2 \cdot 2504$ | 2629 | 2754 | 2879 | 3004 | 3129 | 3254 | 337 | 35 | 362 | 43 |
| 44 | 9397 | 9390 | 9384 | 9377 | 9370 | 363 | 9356 | 9349 | 9342 | 43.933 | 28 | 315 | 3283 | 3411 | 3539 | 366 | 3795 | 392 | 405 | 417 | 44 |
| 45 | 938 | 9376 | 9370 | 936 | 9356 | 9349 | 9342 | 9334 | 9327 | 44.932 | 3551 | 3682 | 3813 | 3943 | 4074 | 4205 | 4335 | 446 | 459 | 472 | 45 |
| 46 | 9370 | 63 | 935 | 93 | 341 | 9334 | 932 | 9320 | 9312 | 45.93 | $2 \cdot 4075$ | 420 | 4342 | 4475 | 4609 | 47 | 4876 | 5010 | 5143 | 52 | 46 |
| 47 | 9356 | 9349 | 934 | 933 | 9327 | 9320 | 9312 | 9305 | 9297 | 46.92 | 2.4598 | 4734 | 4871 | 5007 | 5146 | 528 | 5417 | 5554 | 5690 | 58 | 47 |
| 48 | 9342 | 9335 |  | 9320 | 9313 | 305 | 9298 | 9290 | 9282 | 47.927 | 2.5121 | 5261 | 5400 | 5540 | 567 | 581 | 5958 | 6097 | 623 | 63 | 48 |
| 49 | 9328 | 9321 |  | 9306 |  |  | 9283 | 9275 | 9267 | 48.92 |  | 5787 | 59 | 6072 | 621 | 635 | 6499 | 664 | 678 |  | 49 |
| 50 | 9315 | 9307 | 9299 | 9292 | 9284 | 9276 | 9268 | 9260 | 253 | 49.92 | 2.6168 | 6313 | 645 | 660 | 67 | 68 | 70 | 718 | 733 | 74 | 50 |
| 51 | 9301 | 9293 | 9285 | 927 | 19270 | 9262 | 9254 | 9246 | 238 | 50 | 691 | 6839 | 6988 | 17136 | 7284 |  |  |  |  |  |  |
| 52 | 9287 | 9279 | 927 | 9263 | 9255 | 9247 | 923 | 923 | 9223 | 51.9214 | 2.7215 | 7366 | 75 | 7668 | 7819 | 7970 | 8121 | 8272 | 8423 | 857 | 52 |
| 53 | 9274 | 9266 | 9257 | 9249 | 9241 | 9233 | 9224 | 9216 | 9208 | 52.9199 | $2 \cdot 7738$ | 7892 | 8046 | 8200 | 8354 | 8508 | 8662 | 8816 | 8970 | 912 | 53 |
| 54 | 9260 | 9252 | 9243 | 9235 | 9227 | 9218 | 9210 | 9201 | 9193 | 53.9184 | 2.8261 | 8418 | 8575 | 8732 | 8889 | 904 | 9203 | 9359 | 951 | 967 | 54 |
| 55 | 9246 | 9238 | 922 | 9221 | 9212 | 9204 | 919 | 9186 | 9178 | 54.91 | 2.8785 | 8945 | 04 | 9264 | 942 | 958 | 9743 | 9903 | -1063 | 022 | 55 |
| 56 | 9233 | 9224 | 9215 | 920 | 9198 | 9189 | 918 | 9172 | 9163 | \|55.915 | $2 \cdot 9308$ | 947 | 9633 | 9796 | 995 | -121 | 0284 | 0447 | 0609 | 077 | 56 |
| 57 | 9219 | 9210 | 9201 | 9193 | 9184 | 9175 | 9166 | 9157 | 9148 | 56.913 | 2.9832 | 9997 | -163 | 0328 | 0494 | 0659 | 0825 | 0991 | 115 | 132 | 57 |
| 58 | 9205 | 9196 | 9187 | 9178 | 9169 | 9160 | 9151 | 9142 | 9133 | 57.9124 | 3.0355 | 0523 | 0692 | 0860 | 1029 | 119 | 1366 | 1534 | 170 | 187 | 58 |
| 59 | 9191 | 9182 | 9173 | 9164 | 9155 | 9146 | 9137 | 9127 | 9118 | 58.9109 | 3.0878 | 105 | 1221 | 1392 | 1564 | 173 | 190 | 2078 | 224 | 242 | 59 |
| 60 | 9178 | 9169 | 9159 | 9150 | 9141 | 131 | 9122 | 9113 | 103 | 59.9093 | 3.1402 | 1576 | 1750 | 1924 | 209 | 227 | 24 | 262 | 279 | 297 | 60 |
|  | 9164 | 915 | 91 | 9136 | 9126 | 9117 | 9107 | 9098 | 9088 | 60.907 | -1925 | 2102 | 22 | 245 | 26 |  | 88 |  |  |  | 61 |
| 62 | 9150 | 9141 | 9131 | 9122 | 9112 | 9102 | 9093 | 9083 | 9073 | 61.9063 | 3.2448 | 2628 | 2808 | 2989 | 3169 | 3349 | 3529 | 3709 | 3889 | 406 | 62 |
|  | 9137 | 9127 | 9117 | 9108 | 9098 | 9088 | 9078 | 9068 | 9058 | 62.904 | 3.2972 | 3155 | 3338 | 3521 | 3704 | 3887 | 4070 | 4253 | 4436 | 46 | 63 |
| 64 | 9123 | 9113 | 9103 | 9093 | 9084 | 9074 | 9063 | 9053 | 9043 | $63 \cdot 903$ | 3.3495 | 3681 | 3867 | 4053 | 4239 | 4425 | 4610 | 4796 | 4982 | 5168 | 64 |
| 65 | 9109 | 099 | 908 | 9079 | 9069 |  |  |  | 9028 | 64.9018 | $3 \times 401$ | 4207 | 439 | 458 | 477 | 496 | 5151 | 534 | 552 | 571 | 65 |
| 66 | 9095 | 908 | 9075 | 9065 | 9055 | 9045 | 9034 | 9024 | 9013 | 65.900 | 3.4542 | 4733 | 4925 | 5117 | 5309 | 5500 | 5692 | 5884 | 6075 | 626 | 66 |
| 67 | 9082 |  | 9061 |  | 4, |  | 902 | 909 | 8998 | 66.898 | . 506 | 5260 | 5454 | 5649 | 5844 | 6038 | 6233 | 6427 | 662 | 68 | 67 |
| 68 | 9068 | 905 | 9047 | 9037 | 9026 | 9016 | 9005 | 8994 | 8983 | $67 \cdot 8973$ | 3.5588 | 5786 | 5983 | 6181 | 6379 | 6576 | 6774 | 6971 | 716 | 736 | 68 |
| 69 | 9054 | 90 | 9033 | 9023 | 9012 | 9001 | 8990 | 8979 | 8968 | 68.895 | 3.6112 | 6312 | 6513 | 6713 | 691 | 7114 | 731 | 7515 | 7715 | 791 | 69 |
| 70 | 9041 | 9030 | 9019 | 9008 | 8998 | 8987 | 8976 | 8965 | 8954 | 69.8942 | 3.6635 | 6838 | 7042 | 7245 | 7449 | 765 | 785 | 805 | 826 | 9 | 70 |
| 71 | 9027 | 90 | 9005 | 89 | 8983 | 8972 | 8961 | 8950 | 8939 | 70.89 | 71 | 7365 | 7571 | 7777 | 798 | 1 |  |  |  |  | 71 |
| 72 | 9013 | 9002 | 8991 | 8980 | 8969 | 8958 | 8946 | 8935 | 8924 | 71.8912 | 37682 | 7891 | 8100 | 8309 | 8518 | 8728 | 8937 | 9146 | 9355 | 956 | 72 |
| 73 | 9000 | 8988 | 8977 | 9 | 955 | 8943 | 8932 | 8920 | 8909 | 72.889 | 3.8205 | 8417 | 8629 | 8841 | 9053 | 926 | 9478 | 9690 | 9902 | -11 | 73 |
| 74 | 8986 | 8975 | 8963 | 8952 | 8940 | 8929 | 8917 | 8905 | 8894 | $73 \cdot 8882$ | 3.8729 | 8944 | 9159 | 9373 | 9588 | 9803 | -018 | 0233 | 0448 |  | 74 |
| 75 | 8972 | 8961 | 894 | 8938 | 226 | 891 | 8903 | 91 | 8879 | 74 -886 | 3.9252 | 947 | 96 | 99 | 112 | 03 | 055 | 0777 | 099 | 121 | 75 |
| 76 | 8958 | 8947 | 8935 |  | 8912 | 8900 | 8888 | 8876 | 8864 | 75.885 | 3.9775 | 9996 | -217 | 0438 | 0658 | 087 | 1100 | 1321 | 154 | 176 | 76 |
|  | 8945 | 33 | 8921 | 893 | 8897 | 8885 | 8873 | 8861 | 8849 | 76.8837 | 4.0299 | 0522 | 0746 | 0970 | 1193 | 1417 | 164 | 1864 | 208 | 23 | 77 |
| 78 | 8931 | 8919 | 8907 | 8895 | 8883 | 8871 | 8859 | 8846 | 8834 | 77 -882 | 4.0822 | 1049 | 1275 | 1502 | 1728 | 1955 | 218 | 2408 | 2635 | 286 | 78 |
| 79 | 8917 | 8905 | 8893 | 8881 | 8869 | 8856 | 8844 | 8832 | 8819 | 78.8806 | 4.1345 | 1575 | 1804 | 2034 | 2263 | 2493 | 2722 | 2952 | 3181 | 3411 | 79 |
| 80 | 8904 | 8891 | 8879 | 8867 | 8854 | 8842 | 8829 | 8817 | 8804 | 79.8791 | 4.1869 | 2101 | 2334 | 2566 | 2798 | 303 | 326 | 349 | 3728 | 396 | 80 |
| 81 | 8890 | 8878 | 8865 | 8853 | 8840 | 8827 | 8815 | 8802 | 8789 | 80.8776 | $4 \cdot 239$ | 2627 | 2863 | 3098 | 3333 | 3569 | 380 | 4039 | 427 |  | 81 |
| 82 | 8876 | 8864 | 8851 | 8838 | 8826 | 8813 | 8800 | 8787 | 8774 | 81.876 | 4.291 | 3154 | 3392 | 3630 | 3868 | 410 | 434 | 4583 | 4821 | 5059 | 82 |
| 83 | 8862 | 8850 | 8837 | 8824 | 887 | 878 | 878 | 8772 | 8759 | 82.8746 | 4.343 | 368 | 3921 | 4162 | 4403 | 464 | 488 | 5127 | 5368 | 560 | 83 |
| 84 | 8849 | 8836 | 8823 | 8810 | 8797 | 8784 | 8771 | 8758 | 8744 | 83.873 | 43962 | 4206 | 4450 | 4694 | 4938 | 5182 | 5426 | 5670 | 5914 | 6158 | 84 |
| 85 | 8835 | 8822 | 8809 | 8796 | 8783 | 8770 | 87 | 8743 | 8729 | 84.8716 | 4.4486 | 473 | 49 | 5226 | 5473 | 572 | 59 | 621 | 646 | 670 | 85 |
| 86 | 8821 | 880 | 878 | 87 | 8768 | 8755 | 8742 | ${ }^{8728}$ | 8714 | 85.870 | 4.5009 | 5259 | 5509 | 5758 | 6008 | 625 | 650 | 6758 | 7007 | 725 | 86 |
| 87 | 8808 | 8794 | 878 | 876 | 8754 | 8741 | 8727 | 8713 | 8699 | $86 \cdot 8686$ | 4.5532 | 578 | 6038 | 6290 | 6543 | 6796 | 704 | 7301 | 7554 | 7807 | 87 |
| 88 | 8794 | 8781 | 8767 | 8753 | 8740 | 8726 | 8712 | 8698 | 8684 | $87 \cdot 8670$ | 4.6056 | 6311 | 6567 | 6823 | 7078 | 7334 | 758 | 7845 | 8101 | 8356 | 88 |
| 89 | 8780 | 8767 | 8753 | 8739 | 8726 | 8712 | 8698 | 8684 | 8669 | 88.8655 | 4.6579 | 6837 | 7096 | 7355 | 7613 | 7872 | 813 | 8389 | 8647 | 890 | 89 |
| 90 | 8767 | 8753 | 8739 | 8725 | 8711 | 8697 | 8683 | 8669 | 8655 | 89•8640 | 4.7102 | 7364 | 7625 | 7887 | 8148 | 8409 | 8671 | 8932 | 9194 | 945 | 90 |
| 91 | 8753 | 8739 | 8725 | 8711 | 8697 | 8683 | ${ }^{8668}$ | ${ }^{8654}$ | 8640 | 90.8625 | 47626 | 7890 | 8154 | 8419 | 8683 | 8947 | 9212 | 9476 | 9740 | P005 | 91 |
| 92 | 8739 | 8725 | 8711 | 8697 | 8683 | 8668 | 8654 | 8639 | 8625 | 91.8610 | 4.8149 | 8416 | 8684 | 8951 | 9218 | 9485 | 975 | -020 | 0287 | 055 | 92 |
| 93 | 8725 | 8711 | 8697 | 8683 | 8668 | 8654 | 863 | 862 | 8610 | 92.8595 | 4.8672 | 8943 | 9213 | 9483 | 9753 | -023 | 0293 | 0563 | 0834 | 110 | 93 |
| 94 | 8712 | 8697 | 8683 | 8668 | 8654 | 8639 | 8624 | 8610 | 8595 | 93.8580 | 4.9196 | 9469 | 9742 | -015 | 0288 | 0561 | 0834 | 1107 | 1380 | 1653 | 94 |
| 95 | 8698 | 8684 | 8669 | 8654 | 540 | 8625 | 8610 | 8595 | 8580 | $94 \cdot 856$ | $4 \cdot 9719$ | 9995 | +27 | 054 | 082 | 109 | 1375 | 165 | 1927 | 2203 | 95 |
| 96 | 8684 | 8670 | 8655 | 8640 | 8625 | 8610 | 8595 | 8580 | 8565 | 95.855 | 5.0243 | 0521 | 0800 | 1079 | 1358 | 1637 | 1916 | 2195 | 2473 |  | 9 |
| 97 | 8671 | 865 | $864]$ | 8626 | 8611 | 8596 | 8581 | 8565 | 8550 | 96.8534 | 5.0766 | 1048 | 1329 | 1611 | 1893 | 2175 | 2456 | 2738 | 3020 | 3302 | 97 |
| 98 | 8657 | 8642 | 8627 | 8612 | 8597 | 8581 | 8566 | 8550 | 8535 | 97-8519 | 5.1289 | 1574 | 1859 | 2143 | 2428 | 2713 | 2997 | 3282 | 3567 | 3851 | 98 |
| 99 | 8643 | 8628 | 8613 | 8598 | 8582 | 8567 | 8551 | 8536 | 8520 | 98.8504 | 5.1813 | 2100 | 2388 | 2675 | 2963 | 3250 | 3538 | 3826 | 4113 | 4401 | 9 |
| 100 | 8630 | 8614 | 8599 | 8584 | 8568 | 8552 | 8537 | 8521 | 8505 | 99.8489 | 5.2336 | 2626 | 2917 | 3207 | 3498 , | 3788 | 4079 | 4369 | 4660 | 4950 | 100 |
|  | $6{ }^{\prime}$ | $59^{\prime}$ | $58^{\prime}$ | 57 | $56^{\prime}$ | $55^{\prime}$ | $54^{\prime}$ | $53^{\prime}$ | 52 | $51^{\prime}$ | $60^{\prime}$ | 59 | $58^{\prime}$ | 57 | $56^{\prime}$ | $55^{\prime}$ | 54 | $53^{\prime}$ | $52^{\prime}$ | 51 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $86^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES．

| 3 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $3^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | $21^{1}$ | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 | 28 | 89＇ | $2{ }^{2}$ | $21^{1}$ | $22^{\prime}$ |  | T |  |  |  |  |  |  |
|  |  | 9983 | 9983 |  |  |  | 9982 | 9982 | 998 |  | 058 | 0584 | 0587 | 5590 | 0593 | 0596 | 0599 | 0602 | 605 |  |  |
|  |  | 9966 | 9965 |  |  |  |  |  |  |  |  | 1169 | 1175 | 1180 |  | 119 | 1198 | 1204 |  |  |  |
|  |  | 9949 | 9 | 9948 |  |  |  |  |  |  |  |  |  |  |  | 17 | 1797 |  |  |  |  |
|  |  |  |  | 9930 | 9930 |  | 99 |  |  |  |  | 2337 | ${ }^{2349}$ | ${ }^{2361}$ | ${ }^{2372}$ |  | 95 |  | 2419 |  |  |
|  |  |  |  |  |  |  | 9981 |  |  | 4 |  | 2922 | 2936 | 2951 |  | 2980 | 94 | 3009 |  |  |  |
|  | 989 | 9897 | 9896 | 9895 | 9894 | 9893 | 9892 | 9891 | 9890 |  |  | 3506 |  | 3541 | 355 | 3576 | 3 | 11 | 28 |  |  |
|  |  |  |  |  |  |  |  |  | 硡 |  |  |  |  |  | 4151 |  | 92 | 4212 |  |  |  |
|  |  |  |  |  |  | 9858 | 9856 | 9855 | 9854 | 7.981 <br> 8.9 | 4652 .5233 | 4575 | 46 | 4721 | 45 | 4768 | 4791 | 4814 | 4837 |  |  |
|  |  |  |  |  |  |  |  | 983 | 983 | $8 \cdot 98$ | ． 5233 | 5259 | $\|5285\|$ | 5311 | $\begin{aligned} & 5338 \\ & 5931 \end{aligned}$ | $\left\|\begin{array}{l} 5364 \\ 5960 \end{array}\right\|$ | 5390 5989 | 5416 6018 | 5442 |  |  |
| 10 | 9831 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | $9799$ |  |  | $\begin{aligned} & 6428 \\ & 712 \end{aligned}$ |  | ${ }_{7082}^{6492}$ | ${ }^{6524} 717$ |  | 888 | $\begin{aligned} & 20 \\ & 21 \end{aligned}$ | 51 |  | 2 |
| 13 |  |  | 97 | 9773 |  |  |  |  |  | 12 |  |  |  |  |  | 7748 |  |  |  |  |  |
|  | 976 |  |  |  |  |  |  |  |  |  |  | 818 | 82 | 82 | 83 | 83 |  |  |  |  |  |
| 15 | 974 |  |  |  |  |  |  |  |  | 14 |  | 8765 | 880 | 8852 |  | 894 | 8983 | 9027 | 9070 |  | 15 |
| 16 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 | 9695 | 96 | 96 |  | 9683 |  | 9677 |  | 967 |  | 1.0466 | 051 |  |  |  | 0727 |  |  |  |  | 1 |
| 19 |  |  |  |  |  |  |  |  |  | 18.964 |  | 110 | 115 | 1213 |  | 1323 |  | 143 |  |  | 19 20 |
| 20 | 96 |  | 保 | ， |  | 9645 | 9641 | 9638 | 9634 | 19 | $1 \cdot 1629$ | 1687 | 17 | 1803 |  |  |  |  |  |  |  |
| 21 | 9645 | 9641 | ${ }^{9638}$ | 19634 | 9630 | 96 | 9623 | 96 | 9616 | 20 | 1.2 | 227 | 2332 | 2393 | 2454 | 15 |  | 2637 |  |  | 21 |
|  |  |  | 96 | 17 |  | 9609 | 96 |  |  | 21 | 1.27 | 285 |  | 29 | 3047 | 3111 | 5 | 323 |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 22 | 1.33 | 34 | 35 | 35 |  | 3707 | 3774 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 25 | 957 | 95 |  |  |  | 9556 |  |  |  | 24 | $1 \cdot 45$ |  | 46 | 47 | 482 |  | 4972 |  | 511 |  | 25 |
| 26 |  |  | 9551 |  |  |  |  |  |  | 2 |  |  |  |  |  |  |  |  |  |  | 26 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 95 | 95 | 95 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 29 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 94 | 94 |  |  |  | 94 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 22 |
|  |  | 94 |  |  |  | 9413 |  | 9402 | 939 | 32 | 1.97 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 33 |  |  |  |  |  |  |  |  |  |  |  |
| 35 |  |  | 93 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 36 | 939 | 9385 |  | 9373 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 92 | 192 |  |  | $\left\lvert\, \begin{aligned} & 92 \\ & 922 \end{aligned}\right.$ |  | ${ }_{02}^{92}$ |  |  |  | $395$ | $\begin{aligned} & 40 \\ & 46 \end{aligned}$ | $\left\lvert\, \begin{aligned} & 419 \\ & 478 \end{aligned}\right.$ |  |  |  |  |  |  |  |
|  |  | 92 |  |  |  |  |  |  |  |  | 2.5 |  | 525 |  |  | 5627 |  |  |  |  | 4 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 | 923 | 9231 | 9223 |  |  |  | 9192 |  |  | 44.916 | $2 \cdot 6165$ |  |  |  |  | 6819 |  |  |  |  |  |
| 46 | 92 | 92 | 9206 |  |  |  | 91 |  | 9158 | $45^{\circ}$ |  |  |  |  |  | 74 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | $46^{6 \cdot 91}$ |  |  |  | 7738 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 9138 |  |  | $47 \cdot 91$ |  |  |  | 832 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | 915 | 91 |  |  |  |  |  |  |  |  | 2.90 | 92 | 9363 |  | 9653 |  |  | 108 | 0234 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 912 | 91 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | － |  |  |  |  |  |  |  |  |  |  |  |  |  | 15 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 1712 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 |  | 90 |  |  |  |  |  |  |  |  |  |  |  | 3639 |  |  |  |  |  |  |  |
|  | 901 | 90 |  |  |  |  |  |  |  |  |  | 38 |  | 422 | 439 | 4566 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 3.4305 |  |  | 4819 |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 61 | 8968 | 89 |  | 8937 |  |  |  |  |  |  |  | 56 | 582 | 6000 | 617 | 6354 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 62 | 64 | 8517 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 891 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 65 | 890 | 8889 | 8878 | 8867 |  | 8845 |  |  | 881 | 64.87 | 3.7794 | 79 | 8172 |  | 8549 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 85 | 875 | 8951 |  | 933 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 88. | 88 |  |  |  |  |  |  |  |  | 3.953 |  |  | ＋131 |  | 05 |  |  |  | 131 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 70 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 | 8799 | ${ }^{87}$ | 8775 | 8762 | 8750 | 8738 |  |  |  |  | $4 \cdot 12$ |  | 169 | ¢ | 2108 | 214 | 231 |  |  |  |  |
|  | 878 |  | 875 | 872 |  | 8720 | 8708 | 86 | 8682 |  | 4 | 2 | 228 | 24 |  | 210 | 311 |  |  |  |  |
|  | 8765 |  |  |  |  | 870 | 869 | 8677 |  | 72：86 | 4 |  | 2870 |  |  | 35 | 37 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 73 |  |  | 34 |  |  | 41 | 43 | 45 |  |  |  |
| 75 | 8731 | 8718 |  |  |  |  | 8654 |  |  |  | 436 |  | 404 |  |  |  |  |  |  |  |  |
|  | 874 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
| 7 | 8697 |  |  |  |  | ${ }^{863}$ |  |  |  |  |  |  | 55 |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 80 | 864 | 863 |  |  |  | 85 | 8564 |  | 8536 |  |  | 67 |  | 72 |  | 7 72 | 7910 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 85 | 85 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 85 | 858 | 8568 | 85 |  | 8525 | 8510 | 84 | 84 |  | 482 | 850 | 8742 | 898 |  | 946 |  |  |  |  |  |
| 84 | 8579 |  |  | 8536 |  |  | 8492 |  | 8463 | \％ | 4.8842 | 9086 | 9330 | － | 981 | ＋061 |  | 05 |  |  |  |
| 85 | 8562 | 8548 | 8533 | 8518 | 8504 | 8489 | 8474 | 8460 | 8445 | 84：8430 | $4 \cdot 9423$ | 967 | 991 | ＋16 | 041 | 065 | 090 | 1 |  | 16 |  |
|  | 854 |  |  |  |  | 8471 |  | 8441 | 8426 |  |  | 025 | 0504 | 075 | 100 | 125 |  |  |  |  |  |
|  | 8528 | 8513 | 84 | 84 | 8469 | 8454 | 8439 | 8423 | 8408 | ${ }^{86}$ 83318 | 5.05 | 08 | 1091 | 134 | 1597 | 2 | 210 |  |  |  |  |
| 88 |  | 84 |  |  |  |  |  |  | 8390 | ${ }_{88}^{87} 83$ | 5.11 |  | ${ }_{226}^{167}$ | 193 | 278 |  |  |  |  |  |  |
| 90 | 8477 | 84 | 8447 | 8431 | 8416 | 8400 | 8385 | 8369 | 8353 | $89 \cdot 833$ | 5.233 | 259 | 285 | 位 | 337 |  | 389 | 416 | 4421 |  |  |
|  | 84 |  |  |  |  | ${ }^{8382}$ |  |  |  |  |  |  |  |  | 5 | 423 |  |  |  |  |  |
|  |  |  |  | 83 | 8381 |  | 83 | 83 |  | 9183 | 5.34 |  | 402 | 429 | 456 | 482 |  |  |  |  |  |
|  |  | 8411 |  |  | 8363 |  |  |  |  |  |  |  | 461 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 829 | 82 |  | 948 |  |  |  |  |  |  |  |  |  |  |  |
| 9 | 8376 |  |  |  |  |  |  |  |  |  |  |  |  | 665 | 693 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 696 |  | 752 |  |  |  |  |  |  |
| 98 |  |  |  |  |  |  |  |  |  |  | 5. |  | 7551 | 783 | 8120 | 8405 |  |  |  |  |  |
|  |  |  |  | 8274 |  |  |  |  |  | 98.8171 | 5.7563 | 785 | 8138 | 84 |  |  | 928 |  |  |  |  |
|  | 3308 | 8291 | 8274 | 325 | 8240 | 8223 | 8205 | 8188 | 8170 | 99.8153 | 5.8145 | 8435 | 8726 | 9016 | 9306 | 959 | 9887 | ＋178 | 0468 | 075 |  |
|  | $40^{\prime}$ | 39 |  | 37 | 36 | $35^{\prime}$ | $34^{\prime}$ |  |  | $31^{\prime}$ |  |  |  | 37＇ | 36 | 35 | 34 |  |  | 31 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.

| $3^{\circ}$ | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $3^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $31^{\prime}$ | \| $32^{\prime}$ | $33^{\prime}$ | $34^{\prime}$ | $35^{\prime}$ | $136^{\prime}$ | [ $37{ }^{\prime}$ | $38^{\prime}$ | 1 $39^{\prime}$ | $30^{\prime}$ | $131^{\prime}$ | 32 | 33' | $134^{\prime}$ | $35^{\prime}$ | $136{ }^{\prime}$ |  | $\begin{array}{\|c\|} \hline 38^{\prime} \\ \hline 0634 \\ \hline \end{array}$ | 39' |  |
|  | 998 | 9981 | 9981 | 9981 | 9981 | 9980 | 9980 | 9980 | 9980 | 9980 | 0610 | 0613 | 0616 | 0619 | 0622 | 0625 | 0628 | 37' ${ }^{\text {631 }}$ |  | 0637 |  |
|  |  | 996 | 9962 | 9962 | 99 | 99 | 99 | 99 | 9960 | 1.9959 | 1221 | 1227 | 1233 | 1238 | 1244 | 1250 | 1256 | 1262 | 1267 | 1273 |  |
|  | 9944 | 9944 | 9943 | 9942 | 9942 | 9941 | 9941 | 9940 | 9940 | 2.95 | 18 | 18 | 18 | 18 | 1866 | 1875 | 18 | 18 | 1901 | 1910 |  |
|  | 9925 | 9925 | 9924 | 9923 | 9923 | 9922 | 9921 | 9920 | 9920 | 3.99 | 2442 | 2454 | 24 | 247 | 24 | 2500 | 25 | 25 | 25 | 2546 |  |
| 5 | 9907 | 9906 | 9905 | 9904 | 9903 | 9902 | 9901 | 9900 | 9900 | 4.9899 | 3052 | 3067 | 308 | 309 | 3110 | 3125 | 31 | 315 | 316 | 3183 |  |
|  | 9888 | 9887 | 9886 | 9885 | 9884 | 9883 | 9882 | 98 | 987 | $5 \cdot 9$ | 3663 | 3680 | 3698 | 3715 | 3733 | 3750 | 37 | 3785 | 3802 | 3820 |  |
|  | 9869 | 9868 | 9867 | 9866 | 9864 | 9863 | 9862 | 986 | 9859 | 6.985 | 4273 | 4294 | 4314 | 433 | 4355 | 4375 | 439 | 441 | 443 | 44 |  |
|  | 9851 | 9849 | 9848 | 9846 | 9845 | 9844 | 9842 | 9841 | 9839 | $7 \cdot 9838$ | 4884 | 4907 | 4930 | 4954 | 4977 | 5000 | 5023 | 504 | 507 | 5093 |  |
|  | 9832 | 9831 | 9829 | 9827 | 9826 | 9824 | 9822 | 9821 | 9819 | 8.9817 | 5494 | 5521 | 5547 | 5573 | 5599 | 5625 | 565 | 567 | 57 | 5730 |  |
| 10 | 9813 | 9812 | 9810 | 9808 | 306 | 85 | 9803 | 9801 | 9799 | 9.9797 | 6105 | 6134 | 6163 | 6192 | 6221 | 6250 | 6279 | 630 | 633 | 6366 | 10 |
| 11 | 9795 | 9793 | 9791 | 97 | 978 | 97 | 978 | 978 | 9779 | 10.977 | 6715 | ${ }^{674}$ | 6779 | 681 | 6843 | 687 | 690 | 6935 | 697 | 7003 | 11 |
| 12 | 9776 | 9774 | 9772 | 9770 | 9768 | 9765 | 9763 | 9761 | 9759 | 11.975 | 7326 | 7361 | 7396 | 743 | 7465 | 7500 | 7535 | 757 | 760 | 763 | 12 |
| 13 | 9758 | 9755 | 9753 | 9751 | 9748 | 9746 | 9743 | 9741 | 9739 | 12.9736 | 7936 | 7974 | 8012 | 805 | 8087 | 8125 | 8163 | 82 | 8238 | 8276 | 13 |
| 14 | 9739 | 9736 | 9734 | 9731 | 9729 | 9726 | 9724 | 9721 | 9719 | 13.9716 | 8547 | 8587 | 8628 | 866 | 8709 | 8750 | 8791 | 88 | 887 | 8913 | 14 |
| 15 | 9720 | 9718 | 9715 | 9712 | 9709 | 9707 | 9704 | 9701 | 9699 | 14.9696 | 9157 | 9201 | 92 | 928 | 9331 | 9375 | 9419 | 9462 | 9506 | 9549 | 5 |
| 16 | 9702 | 9699 | 19696 | 9693 | 9690 | 9687 | 9684 | 9681 | 96 | 15 | -9768 | 98 | 9861 | 9907 | 9954 | 1000 | 0046 | 0093 | 0139 | 0186 | 16 |
| 17 | 9683 | 9680 | 9677 | 9674 | 9671 | 9668 | 966 | 966 | 9658 | 16.965 | 1.0378 | 0428 | 0477 | 052 | 0576 | 0625 | 067 | 07 | 0773 | 0822 | 17 |
| 18 | 9664 | 9661 | 9658 | 9655 | 9651 | 9648 | 9645 | 9642 | 9638 | 17.963 | 1.0989 | 1041 | 1093 | 1146 | 1198 | 1250 | 1302 | 135 | 1407 | 145 | 18 |
| 19 | 9646 | 9642 | 9639 | 9635 | 9632 | 9629 | 9625 | 9622 | 9618 | 18.9615 | $1 \cdot 1599$ | 1654 | 171 | 176 | 1820 | 1875 | 1930 | 1985 | 20 | 209 | 19 |
| 20 | 2627 | 9623 | 9620 | 9616 | 9613 | 9609 | 9605 | 9602 | 9598 | 19.9594 | 12210 | 2268 | 2326 | 2384 | 2442 | 2500 | 2558 | 261 | 267 | 2732 | 20 |
| 21 | 9608 | 9605 | 9601 | 9597 | 95 | 9589 | 9586 | 9582 | 957 | 20 | 1.2820 | 288 | 294 | 300 | 30 | 312 | 3186 | 324 | 3308 | 3369 | 21 |
| 22 | 9590 | 9586 | 9582 | 957 | 957 | 957 | 9566 | 9562 | 9558 | 21.955 | $\cdot 343$ | 3495 | 355 | 362 | 3686 | 3750 | 3814 | 387 | 39 | 400 | 22 |
| 23 | 9571 | 9567 | 9563 | 9559 | 9555 | 9550 | 9546 | 9542 | 9538 | 22.953 | $1 \cdot 4041$ | 4108 | 4175 | 4242 | 4308 | 4375 | 4442 | 450 | 45 | 464 | 23 |
| 24 | 9552 | 9548 | 9544 | 9539 | 9535 | 9531 | 9526 | 9522 | 9518 | 23.951 | 1.4652 | 4721 | 4791 | 486 | 493 | 5000 | 5070 | 513 | 520 | 527 | 24 |
| 25 | 9534 | 9529 | 9525 | 9520 | 9516 | 9511 | 9507 | 9502 | 9498 | 24.9493 | 1.5262 | 533 | 54 | 5480 | 55 | 56 | 5698 | 5770 | 5843 | 591 | 25 |
| 26 | 951 | 9510 | 9506 | 95 | 94 | 9492 | 9487 | 88 | 947 | 25 | 5873 | 5948 | 6024 | 60 | 61 | 6250 | 632 | 64 | 6476 | 655 | 26 |
| 27 | 9496 | 9492 | 9487 | 9482 | 9477 |  | 9467 | 9462 | 945 | $26 \cdot 945$ | 1.648 | 6562 | 6640 | 671 | 6797 | 6875 | 6953 | 703 |  | 7189 | 27 |
| 28 | 9478 | 9473 | 9468 | 9463 | 9458 | 53 | 4 | 9442 | 943 | $27 \cdot 9432$ | $1 \cdot 70$ | 7175 | 7256 | 733 | 7419 | 7500 | 758 | 766 | 77 | 78 | 28 |
| 29 | 9459 | 9454 | 9449 | 9444 | 9438 | 9433 | 9428 | 9422 | 9417 | 28.9412 | 1770 | 778 | 7872 | 7957 | 8041 | 8125 | 820 | 829 | 837 | 846 | 29 |
| 30 | 9440 | 9435 | 9430 | 9424 | 419 | 9414 | 9408 | 9403 | 9397 | 29.9391 | 1.8315 | 8402 | 8489 | 8576 | 8663 | 8750 | 883 | 892 | 901 | 909 | 30 |
| 31 | 9422 | 9416 | 9411 | 9405 | 9400 | 9394 | 93 | 9383 | 9377 | 30.93 | 1.892 | 90 | 910 | 919 | 92 | 93 | 946 | 955 | 9645 | 9735 | 31 |
| 32 | 9403 | 9397 | 9392 | 938 | 93 | 9374 | 93 | 9363 | 9357 | 31.935 | 1.953 | 9628 | 9721 | 981 | 99 | 10 | 009 | 018 | 02 | 03 | 32 |
| 33 | 938 | 9379 | 9373 | 9367 | 9361 | 9355 | 9349 | 9343 | 9337 | 32.9331 | 2.0146 | 0242 | 0338 | 0433 | 0529 | 0625 | 0721 | 081 | 09 | 100 | 33 |
| 34 | 9366 | 9360 | 9354 | 9348 | 9341 | 9335 | 9329 | 9323 | 9317 | 33.9310 | 2.075 | 0855 | 0954 | 1053 | 115 | 1250 | 1349 | 144 | 15 | 16 | 34 |
| 35 | 9347 | 9341 | 9335 | 9328 | 22 | 9316 | 09 | 9303 | 9297 | 34.9290 | 2.1367 | 1469 | 1570 | 1672 | 177 | 18 | 1977 | 207 | 2180 | 228 | 35 |
| 36 | 932 | 93 | 16 | 9309 | 9303 | 9296 | 9290 | 9283 | 276 | $35^{\circ}$ | 2.19 | 2082 | 2187 | 229 |  | 25 | 2605 | 2709 | 2814 | 2918 | 36 |
| 37 | 9310 | 9303 | 9297 | 9290 | 9283 | 927 | 9270 | 9263 | 9256 | 36.924 | 2.2588 | 2695 | 2803 | 2910 | 30 | 3125 | 3232 | 334 | 34 | 35 | 37 |
| 38 | 9291 | 9284 | 9278 | 9271 | 9264 | 9257 | 9250 | 9243 | 9236 | 37.922 | 2.3198 | 3309 | 3419 | 352 | 36 | 37 | 38 | 397 | 40 | 419 | 38 |
| 39 | 9273 | 9266 | 9259 | 9252 | 245 | 9238 | 9230 | 9223 | 9216 | 38.920 | 238809 | 3922 | 4035 | 4149 | 4262 | 437 | 448 | 460 | 4715 | 48 | 39 |
| 40 | 9254 | 9247 | 9240 | 9232 | 25 | 9218 | 9211 | 9203 | 9196 | 39.918 | 2.4419 | 4536 | 4652 | 4768 | 4884 | 5000 | 5116 | 523 | 5348 | 546 | 40 |
| 41 | 9235 | 9228 | 9221 | 9213 | 920 | 9198 | 9191 | 9183 | 9176 | 40 | 2.503 | 5149 | 52 | 53 | 550 | 5625 | 5744 | 5863 | 5982 | 6101 | 41 |
| 42 | 9217 | 9209 | 9202 | 9194 | 9187 | 9179 | 9171 | 9164 | 9156 | $41^{\circ}$ | 2.5640 | 5762 | 5884 | 600 | 612 | 62 | 6372 | 649 | 66 | 673 | 42 |
| 43 | 9198 | 9190 | 9183 | 9175 | 9167 | 9159 | 151 | 9144 | 9136 | 42.912 | $2 \cdot 6251$ | 6376 | 6501 | 662 | 6750 | 6875 | 7000 | 712 | 72 | 737 | 43 |
| 44 | 9179 | 9171 | 9164 | 9156 | 9148 | 9140 | 132 | 9124 | 9116 | 43.910 | 2.6861 | 6989 | 7117 | 724 | 7372 | 7500 | 762 | 775 | 78 | 80 | 44 |
| 45 | 9161 | 9153 | 9145 | 9136 | 9128 | 9120 | 9112 | 9104 | 9096 | $44 \cdot 9087$ | 2.7472 | 760 | 7733 | 786 | 799 | 81 | 8256 | 838 | 8517 | 86 | 45 |
| 46 | 914 | 913 | 26 | 9117 | 9109 | 9101 | 9092 | 9084 | 9075 | 45 | 082 | 8216 | 8349 | 848 | 861 | 87 | 8884 | 90 | 9151 | 9284 | 46 |
| 47 | 9123 | 9115 | 9107 | 9098 | 9090 | 9081 | 9073 | 9064 | 9055 | 46.904 | 2.8693 | 8829 | 8966 | 9102 | 9239 | 9375 | 9512 | 9648 | 978 | 992 | 47 |
| 48 | 9105 | 9096 | 9088 | 9079 | 9070 | 9062 | 9053 | 9044 | 9035 | $47 \cdot 9026$ | $2 \cdot 9303$ | 9443 | 9582 | 9721 | 986 | \$000 | 0139 | 0279 | 04 | 0557 | 48 |
| 49 | 9086 | 9077 | 9069 | 9060 | 51 | 9042 | 033 | 24 | 9015 | 48.900 | 2.9914 | +056 | 0198 | 0341 | 0483 | 062 | 076 | 0910 | 105 | 119 | 49 |
| 50 | 9067 | 9059 | 9050 | - | 32 | 9023 | 9013 | . 04 | 8995 | 49.898 | 3.0524 | 0669 | 0815 | 0960 | 1105 | 1250 | 139 | 154 | 168 | 183 | 50 |
| 51 | 9049 | 9040 | 9031 | 9021 | 9012 | 9003 | 8994 | 8984 | 8975 | 50.896 | 3.1135 | 1283 | 1431 | 1579 | 1727 | 1875 | 2023 | 2171 | 231 | 246 | 51 |
| 52 | 9030 | 9021 | 9012 | 9002 | 8993 | 8983 | 8974 | 8964 | 8955 | 51.894 | 3.1745 | 1896 | 2047 | 2198 | 2349 | 2500 | 2651 | 2802 | 295 | 310 | 52 |
| 53 | 9011 | 9002 | 8993 | 8983 | 8973 | 8964 | 54 | 8944 | 8935 | $52 \cdot 892$ | 3.2356 | 2510 | 2663 | 2817 | 2971 | 3125 | 327 | 343 | 35 | 374 | 53 |
| 54 | 8993 | 898 | 8974 |  |  | 8944 | 89 | 89 | 8915 | $53 \cdot 890$ | 3.2966 | 3123 | 3280 | 343 | 359 | 3750 | 3907 | 4064 | 4220 | 437 | 54 |
| 55 | 8974 | 8964 | 8955 | 8945 | 8935 | 89 | 15 | 05 | 8895 | 54.8884 | 3.3577 | 3736 | 3896 | 4056 | 4215 | 4375 | 4535 | 4694 | 4854 | 501 | 55 |
| 56 | 89 | 8946 | 8935 | 8925 | 8915 | 8905 | 8895 | 8885 | 8874 | 55.8864 | 3.4187 | 43 | 45 | 467 | 48 | 5000 | 5163 | 5325 | 5488 | 5650 | 56 |
| 57 | 8937 | 8927 | 8916 | 8906 | 8896 | 8886 | 8875 | 8865 | 8854 | 56.884 | 3.4798 | 4963 | 5129 | 5294 | 5460 | 5625 | 5791 | 595 | 612 | 628 | 57 |
| 58 | 8918 | 8908 | 8897 | 8887 | 8877 | 8866 | 8855 | 8845 | 8834 | 57-882 | 3.5408 | 5577 | 5745 | 5913 | 608 | 6250 | 6418 | 65 | 675 | 692 | 58 |
| 59 | 8900 | 8889 | 8878 | 8868 | 857 | 8847 | 836 | 825 | 8814 | 58.8803 | 3.6019 | 6190 | 6361 | 6533 | 6704 | 6875 | 7046 | 721 | 738 | 756 | 59 |
| 60 | 8881 | 8870 | 8859 | 8849 | 8838 | 8827 | 8816 | 8805 | 8794 | 59.878 | 3.6629 | 6803 | 6978 | 715 | 732 | 750 | 767 | 784 | 802 | 8197 | 60 |
| 61 | 8862 | 8851 | 8840 | 8829 | 8818 | 8807 | 8796 | 8785 | 8774 | 60.876 | 3.7240 | 7417 | 7594 | 7771 | 7948 | 8125 | 8302 | 8479 | 8656 | 8833 | 61 |
| 62 | 8844 | 8833 | 8821 | 8810 | 8799 | 8788 | 8777 | 8765 | 8754 | 61.874 | $3 \cdot 7850$ | 8030 | 82 | 839 | 85 | 8750 |  | 911 |  | 94 | 6 |
| 63 | 8825 | 8814 | 8802 | 8791 | 8780 | 8768 | 8757 | 8745 | 8734 | $62 \cdot 8722$ | 3.8461 | 8644 | 8826 | 9009 | 9192 | 9375 | 9558 | 9741 |  | 110 | 63 |
| 64 | 8806 | 8795 | 8783 | 8772 | 8760 | 8749 | 8737 | 8725 | 8714 | $63 \cdot 8702$ | 3.9071 | 9257 | 9443 | 9629 | 98 | -000 | 0186 | 0372 | 0558 | 0743 | 64 |
| 65 | 8788 | 8776 | 8764 | 8753 | 8741 | 8729 | 8717 | 8705 | 8694 | 64-8682 | 3.9682 | 9870 | +059 | 0248 | 0436 | 062 | 0814 | 1003 | 1191 | 1380 | 65 |
| 66 | 876 | 87 | 8745 | 8734 | 87 | 87 | 8698 | 86 | 8673 | 65 | 4.029 | 0484 | 06 | 086 | 1 | 1250 | 14 | 16 | 182 |  | 66 |
| 68 | 8750 | 8738 | 8726 | 8714 | 8702 | 8690 | 8678 | 8666 | 8653 | 66.864 | 4.090 | 1097 | 1292 | 148 | 1681 | 187 | 2070 | 2264 | 2459 | 2653 | 67 |
| 68 | 8732 | 8720 | 8707 | 8695 | 8683 | 8671 | 8658 | 8646 | 8633 | 67-862 | $4 \cdot 1513$ | 1710 | 1908 | 2105 | 2303 | 2500 | 2698 | 289 | 309 | 329 | 68 |
| 69 | 8713 | 8701 | 8688 | 8676 | 8664 | 8651 | 8638 | 8626 | 8613 | $68 \cdot 8600$ | 42123 | 2324 | 2524 | 2725 | 2925 | 3125 | 3325 | 352 | 372 | S92 | 69 |
| 70 | 8694 | 8682 | 86 | 865 | 864 | 8632 | 8619 | 860 | 8593 | 69.858 | 4.2734 | 2937 | 314 | 334 | 354 | 375 | 395 | 415 | 436 | 456 | 70 |
| 71 | 8676 | 8663 | 8650 | 8638 | 8625 | 8612 | 8599 | 8586 | 8573 | 70.856 | 4.3344 | 3551 | 3757 | 3963 | 4169 | 4375 | 4581 | 478 | 499 | 520 |  |
| 72 | 8657 | 8644 | 8631 | 8618 | 8605 | 8592 | 8579 | 8566 | 8553 | 71.854 | 4*3955 | 4164 | 4373 | 4582 | 4791 | 5000 | 5209 | 5418 | 562 | 583 | 72 |
| 73 | 8638 | 8625 | 8612 | 3599 | 8586 | 8573 | 8559 | 8546 | 8533 | 72.851 | 4.4565 | 4777 | 4989 | 520 | 5413 | 5625 | 5837 | 604 | 626 | 6473 | 73 |
| 74 | 8620 | 8607 | 8593 | 8580 | 8567 | 8553 | 8540 | 8526 | 8513 | $73 \cdot 8499$ | 4.5176 | 5391 | 5606 | 5821 | 6035 | 6250 | 6465 | 668 | 6895 | 7109 | 74 |
| 75 | 8601 | 8588 | 8574 | 8561 | 8547 | 8534 | 8520 | 8506 |  | 74.8479 | 4.5786 | 604 | 6222 | 6440 | 665 | 6875 | 093 | 731 | 7528 | 7746 | 75 |
| 76 | 8582 | 8569 | 8555 | 8542 | 8528 | 8514 | 8500 | 8486 | 8472 | 75.845 | . 639 | 6618 | 6838 | 7059 | 7280 | 7500 | 7721 | 794 |  | 8383 | 76 |
| 77 | 8564 | 8550 | 8536 | 8522 | 8509 | 8495 | 8481 | 8466 | 8452 | 76.8438 | $4 \cdot 7007$ | 7231 | 7454 | 7678 | 7902 | 8125 | 8349 | 8572 | 8796 | 9019 | 77 |
| 78 | 8545 | 8531 | 8517 | 8503 | 8489 | 8475 | 8461 | 8447 | 8432 | 77-8418 | 4.7618 | 7844 | 8071 | 8297 | 8524 | 8750 | 8977 | 9203 | 9429 | 965 | 78 |
| 79 | 8526 | 8512 | 8498 | 8484 | 8470 | 8456 | 8441 | 8427 | 8412 | 78.8398 | 4.8228 | 8458 | 8687 | 8916 | 9146 | 9375 | 9604 | 9834 | -069 | 29 | 9 |
| 80 | 85 | 8494 | 8479 | 846 | 8450 | 8436 | 8421 | 8407 | 8392 | 79.8377 | $4 \cdot 8839$ | 9071 | 9303 | 953 | 976 | 1000 | 023 | 046 | 069 | 092 | 80 |
| 81 | 84891 | 8475 | 8460 | 8446 | 8431 | 8416 | 8402 | 8387 | 8372 | 80.835 | 4.9449 | 9685 | 9920 | ${ }^{1} 15$ | 0390 | 0625 | 0860 | 109 | 133 | 15 | 81 |
| 82 | 8471 | 8456 | 8441 | 842 | 8412 | 8397 | 8382 | 8367 | 8352 | 81.833 | 5.0060 | 0298 | 0536 | 0774 | 1012 | 1250 | 1488 | 172 | 196 | 220 | 82 |
| 8 | 8452 | 8437 | 8422 | 8407 | 8392 | 8377 | 8362 | 8347 | 8332 | 82.831 | 5.0670 | 0911 | 1152 | 1393 | 1634 | 1875 | 2116 | 235 | 259 | 283 | 83 |
| 84 | 8433 | 8418 | 8403 | 8388 | 8373 | 8358 | 8342 | 8327 | 8312 | 83.8296 | $5 \cdot 1281$ | 1525 | 176 | 2012 | 2256 | 2500 | 2744 | 2988 | 3232 | 3476 | 84 |
| 85 | 8415 | 8399 | 8384 | 8369 | 8354 | 8338 | 8323 | 8307 | 29 | 84827 | 5.1891 | 2138 | 238 | 263 | 2878 | 3125 | 3372 | 3619 | 3865 | 4112 | 85 |
| 86 | 8396 | 8381 | 8365 | 8350 | 8334 | 8319 | 8303 | 8287 | 8271 | 85.825 | 5.2502 | 2751 | 3001 | 3251 | 3501 | 3750 | 4000 | 4249 | 449 | 4749 | 8 |
| 87 | 8377 | 8362 | 8346 | 8331 | 8315 | 8299 | 8283 | 8267 | 8251 | 86.8235 | 5.3112 | 3365 | 3617 | 3870 | 4123 | 4375 | 4628 | 4880 | 5133 | 538 | 8 |
| 88 | 8359 | 8343 | 8327 | 8311 | 8296 | 8280 | 8263 | 8247 | 8231 | 87.8215 | 5.3723 | 3978 | 4234 | 4489 | 4745 | 5000 | 5256 | 551 | 576 | 602 | 88 |
| 89 | 8340 | 8324 | 8308 | 8292 | 8276 | 8260 | 8244 | 8227 | 8211 | 88.8195 | $5 \cdot 4333$ | 4592 | 4850 | 5108 | 5367 | 5625 | 5884 | 614 | 6400 | 6659 | 89 |
| 90 | 8321 | 8305 | 8289 | 8273 | 8257 | 8241 | 8224 | 8208 | 8191 | 89-8174 | 5.4944 | 5205 | 5466 | 5728 | 5989 | 6250 | 6511 | 6773 | 7034 | 7295 | 90 |
| 91 | 8303 | 8286 | 8270 | 8254 | 8237 | 8221 | 8204 | 8188 | 8171 | 190.8154 | $5 \cdot 5554$ | 5818 | 6083 | 6347 | 6611 | 6875 | 7139 | 7404 | 766 | 793 | 91 |
| 92 | 8284 | 8268 | 8251 | 8235 | 8218 | 8201 | 8185 | 8168 | 8151 | 91.8134 | 5.6165 | 6432 | 6699 | 6966 | 7233 | 7500 | 7767 | 803 | 830 | 856 | 92 |
| 93 | 8265 | 8249 | 8232 | 8215 | 8199 | 8182 | 8165 | 8148 | 8131 | 92.8114 | 5.6775 | 7045 | 7315 | 7585 | 7855 | 8125 | 8395 | 8665 | 893 | 920 | 93 |
| 94 | 8247 | 8230 | 8213 | 8196 | 8179 | 8162 | 8145 | 8128 | 8111 | $93 \cdot 8093$ | 5.7386 | 7659 | 7931 | 8204 | 8477 | 8750 | 9023 | 929 | 956 | 984 | 94 |
| 95 | 822 | 8211 | 819 | 8177 | 8160 | 8143 | 8125 | 8108 | 8091 | 94.8073 | $5 \cdot 7996$ | 8272 | 8548 | 820 | 847 | 937 | 923 | 992 | 956 | 984 | 94 |
| 96 | 8209 | 8192 | 8175 | 8158 | 8141 | 8123 | 8106 | 8088 | 8070 | 95.8053 | 5.8607 | 8885 | 9164 | 9443 | 9722 | 4000 | 0279 | 0558 | 0836 | 175 | 96 |
| 97 | 8191 | 8173 | 8156 | 8139 | 8121 | 8104 | 8086 | 8068 | 8050 | 96.8032 | 5.9217 | 9499 | 9780 | -062 | 0344 | 0625 | 0907 | 1188 | 1470 | 175 | 7 |
|  | 8172 | 8155 | 8137 | 8119 | 8102 | 8084 | 8066 | 8048 | 8030 | 97.8012 | 5.9828 | -112 | 0397 | 0681 | 0966 | 1250 | 1535 | 1819 | 2104 | 2388 | 98 |
| 99 | 8153 | 8136 | 8118 | 8100 | 8082 | 8065 | 8046 | 8028 | 8010 | 98.7992 | 6.0438 | 0726 | 1013 | 1300 | 1588 | 1875 | 2163 | 2450 | 2737 | 3025 | 99 |
| 100 | 8135 | 8117 | 8099 | 8081 | 8063 | 8045 | 3027 | 8008 | 7990 | 99•7972 | 6.1049 | 1339 | 1629 | 1920 | 2210 | 2500 | 2791 | 3081 | 3371 | 3661 | 100 |
|  | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | 26 | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ | $22^{\prime}$ | ${ }^{17}$ | $30^{\prime}$ | , | $28^{\prime}$ | $27^{\prime}$ | 26 | $25^{\prime}$ | 24' | $23^{\prime}$ | $22^{\prime}$ | $21^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $86^{\circ}$ |

TRAVERSE TABLES．

| Cosine． |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $3^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\prime}$ | 41 | $42^{\prime}$ | 43 | $44^{\prime}$ | $45^{\prime}$ | 46＇ | 47＇ | 48 | 49＇ | $40^{\prime}$ | $41^{\prime}$ | $42^{\prime}$ |  | 44 | $45^{\prime}$ | $46^{\prime}$ | 47 |  |  |  |
|  | 9980 | 99 | 9979 | 997 | 99 | 99 | 99 | 9978 | 9978 | ． 9978 | 0640 | 0642 | 0645 | 0648 | 0651 | 0654 | 0657 | 0660 | 0663 | 0666 |  |
| 2 | 9959 | 9959 |  | 99 |  | 9957 | 9957 |  |  | 1.995 | 27 | 1285 | 129 | 1296 | 1302 | 1308 | 1314 | 1320 | 1325 |  |  |
| 3 | 9939 | 9938 | 9937 | 9937 | 0936 | 9936 | 993 | 99 | 99 |  | 1919 | 192 | 1936 | 19 | 195 | 1962 | 197 | 1980 | 1988 | 199 |  |
| 4 | 9918 |  | 9917 | 9916 |  | 14 | 9914 |  | 告 |  | 2558 | 2570 | 258 | 25 | 2605 | 2616 | 2628 |  | 2651 |  |  |
| 5 | 9898 | 9897 | 9896 | 9895 | 9894 | 9893 | 9892 | 9891 | 9890 | 4.9889 | 3198 | 3212 | 3227 | 324 | 3256 | 3270 | 328 | 3299 | 3314 | 3328 |  |
| 6 | 9877 | 9876 | 9875 | 9874 | 9873 | 9872 | 9870 | 9869 | 9868 | 5.986 | 8837 | 3855 | 38 | 3889 | 3907 | 39 | 3942 | 3959 | 3976 | 3994 |  |
|  | 9857 | 9855 | 9854 | 985 | 9851 |  |  |  | 9846 |  |  | 44 | 4517 | 45 | 45 | 45 | 45 | 46 | 4639 | 46 |  |
| 8 | 9836 |  |  |  |  |  | 9827 | 9826 | 9824 |  | 5176 | 5139 | 516 | 5186 | 5209 | 5232 | 5255 | 5279 | 5302 | 532 |  |
| 9 | 9816 | 9814 |  | 9811 | 9809 |  |  |  |  |  |  | 5782 | 58 |  |  | 58 | 5912 | 5939 | 596 |  |  |
| 10 | 9795 |  |  |  |  |  |  |  |  | 9 |  | 6424 | 6453 | 6482 | 6511 | 6540 | 6569 | 6598 | 6627 | 6656 | 0 |
| 11 | 9775 | 9773 | 9771 | 9769 |  | 9764 |  |  | 9758 | $10^{\circ}$ | O35 | 7067 | 709 | 7130 |  |  |  |  |  |  |  |
| 12 | 975 | 97 |  |  |  |  |  |  | 9736 |  |  | 770 | 774 | 777 |  | 78 | 7883 | 79 | 7953 |  |  |
| 13 | 973 | 9731 | 9729 |  |  | 97 | 9719 |  | 9714 | 12.97 | 314 | 8351 | 838 | 8427 | 84 | 850 | 85 | 85 | 86 | 86 |  |
| 14 | 97 |  |  |  |  |  |  |  | 9692 |  | 3953 | 8994 | 90 | 907 | 9116 | 915 | 9197 | 923 | 9278 | 931 |  |
| 15 | 9693 | 9690 | 9687 | 9685 | 9682 | 9679 | 9676 | 9673 | 9670 | 14. | 9593 | 9636 | 9680 | 9723 | 9767 | 9810 | 985 | 989 | 9941 | 99 | 15 |
| 16 | 967 | 966 | 96 | 9663 | 9660 | 9657 | 9654 | 9651 | 9648 | 15 | 1.0232 | 02 | 0325 | 0372 | 0418 | 046 | 0511 | 0557 | 0604 | 065 | 16 |
| 17 | 965 |  |  |  |  |  | 9633 |  |  | 1 |  | 0921 |  |  |  | 111 | 1168 | 12 |  |  |  |
| 18 | 9632 | 962 | 962 |  | 9618 |  | 9611 |  |  |  |  | 1564 | 16 | 166 | 1720 | 1773 | 1825 | 187 |  | 198 | 18 |
| 19 | 9611 | 9608 | 960 |  | 9597 |  |  |  |  | 18.95 |  | 2206 | 2 | 23 | 2371 | 2427 | 2482 | 25 |  |  | 19 |
| 20 | 95 |  |  |  | 9576 |  |  |  |  | 19.955 | 2790 | 2848 | 290 | 2965 | 3023 | 308 | 13 | 319 | 3255 |  | 20 |
| 21 | 95 | 9566 | 9562 |  | 9554 |  | 9546 |  |  | 20.953 | 13430 | 3491 | 3552 | 361 | 367 | 373 |  |  |  |  | 11 |
| 22 | 955 | 954 | 954 | 95 | 953 |  | 95 |  | 9516 | 21.95 |  | 413 | 41 | 4261 |  | 438 | 4453 | 45 | 45 | 464 | 22 |
| 23 | 95 | 95 | 952 |  |  |  | 9503 |  |  | 22.949 |  | 477 | 48 |  |  | 50 | 5109 | 51 |  |  | 23 |
| 24 | 95 | 9504 |  |  |  |  |  |  |  |  |  | 5418 | 548 |  | 562 |  | 5766 |  |  |  | 24 |
| 25 | 948 | 9484 | 9479 | 9474 | 9469 | 9465 | 9460 | 9455 | 9450 | 24.9446 | －5988 | 6061 | 613 | 62 | 62 | 6351 | 642 | 6496 | 6568 |  | 25 |
| 26 | 946 | 94 | 9458 | 9453 | 9448 | 9443 | 9438 | 9433 | 9428 | 25.9423 | ． 662 | 6703 | 6778 | 6854 | 6929 | 7005 | 7080 | 7156 | 7231 | 7307 | 26 |
| 27 |  |  |  |  |  |  |  |  |  |  |  |  | 7424 |  |  | 7659 | 7737 | 781 |  |  | 27 |
| 28 | 9427 | 9422 | 9416 | 941 | 9406 | 9400 |  | 9390 | 9384 | 27.937 | 790 | 79 | 80 | 81 | 8232 | 83 | 83 | 84 | 8557 | 863 | 28 |
| 29 | 940 | 9401 |  |  |  |  |  |  |  | 28.93 |  | 863 | 87 | 879 |  | 89 | 905 | 9135 |  |  | 29 |
| 30 | 9386 | 9380 | 937 |  |  | 9358 | 9352 |  |  | 29.933 |  | 9273 | 936 |  |  |  | 9708 | 979 |  |  |  |
| 31 | 9365 |  |  |  |  |  |  |  |  | 30.931 |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 934 | 93 | 9333 | 932 |  |  |  |  |  | 31.92 |  |  |  |  |  | 092 | 1022 | 11 |  |  | 32 |
| 33 | 932 |  | 9312 |  |  |  |  |  |  | 32.92 | 104 |  |  |  |  |  |  | 177 |  |  | 33 |
| 34 | 9304 | 9218 |  |  |  | 9272 | 9266 |  |  |  |  | 18 | 19 | 204 | 21 | 223 | 233 | 243 | 25 | 263 | 34 |
| 35 | 9284 | 9277 | 927 | 926 | 9257 | 9251 |  | 9237 | 9231 | 34.922 | $2 \cdot$ | 248 | 258 | 2688 | 27 | 289 | 299 | 309 | 31 | 329 | 35 |
| 36 | 9263 | 9256 | 9250 | 9243 | 9236 | 9229 | 9222 | 9215 | 9209 | 35.9202 | $2 \cdot 302$ | 3127 | 3232 | 333 | 3441 | 3545 | 3650 | 3754 |  |  | 36 |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 922 | 92 |  | 920 | 9194 | 9186 |  | 917 | 9165 | 37.91 | ． 43 | 44 | 45 | 46 |  | 4853 | 4963 | 507 | 5184 |  | 38 |
| 39 | 920 | 91 | 9187 |  | 9172 |  |  |  |  | 38.91 |  | 50 |  | 52 |  | 55 | 20 | 57 |  |  | 39 |
| 40 | 91 | 9174 | 9166 |  | 915 | 9144 | 9136 |  |  | 39.9113 | 2.5581 | 5697 | 5813 |  |  |  | 6277 | 639 | 6510 | 662 | 40 |
| 41 | 916 | 9153 |  |  |  |  |  |  |  |  |  |  | 645 |  |  |  |  |  |  |  |  |
| 42 | 914 | 9132 |  |  |  |  |  |  |  |  |  |  | 710 |  |  |  |  | 771 |  |  | 42 |
| 43 |  | 91 |  |  |  |  |  |  | 9055 | 42.904 |  | 7624 | 7749 |  |  | 8123 | 8248 | 8373 |  | 362 | 3 |
| 44 | 90 | 90 |  | 907 |  |  |  |  |  | 43 |  |  | 8394 | 852 | 86 | 87 | 8905 | 9033 | 9161 |  | 44 |
| 45 | 907 | 90 | 906 | 905 |  |  |  |  |  | 44 | $2 \cdot 8778$ |  | 90 | ， | 93 | 943 | 9562 | 969 | 9823 |  | 45 |
| 46 | 9058 | 9050 |  |  |  |  |  |  |  | $45 \cdot 89$ |  |  |  |  |  | ＋085 | 0219 | 0352 |  |  | 46 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1012 |  |  |  |
| 48 | 901 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 167 |  |  |  |
| 49 |  |  |  |  |  |  |  |  |  | 48.89 | $3 \cdot 1336$ | 147 | 162 | 176 | 1905 | 2048 | 219 | 233 | 2474 | 261 | 9 |
| 50 | 8977 | 8967 | 8958 | 8948 | 893 | 8929 | 8920 |  |  | 49.889 | 3．1976 | 212 | 226 | 2411 | 25 | 2702 | 2847 | 232 | 3137 | 328 | 50 |
| 51 |  |  |  |  |  |  |  |  |  |  | 3.2615 | 27 |  |  |  |  |  |  |  |  | 51 |
| 52 |  |  |  |  |  |  |  |  |  |  |  |  | 355 |  |  |  | 416 | 43 |  |  | 52 |
| 53 |  |  |  |  |  | 8865 |  |  |  | $52 \cdot 88$ |  | 40 | 42 | 43 | 4510 | 466 | 481 | 49 |  |  | 53 |
| 54 | 889 | 8885 |  |  |  |  |  |  |  |  |  |  | 48 |  |  | 5318 | 547 | 56 |  |  | 54 |
| 55 | 8874 | 8864 |  |  | 8833 | 8822 | 8812 |  | 8791 | 54．8780 | 3.5173 | 53 | 5493 | 5652 | 5812 | 59 | 6131 | 6291 | 6451 | 6610 | 55 |
| 56 | 8854 | 8843 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8833 | 882 | 881 |  |  | 8780 | 8769 |  |  | ．87 | 3.6452 |  |  |  |  |  | 74 | 76 |  |  | 57 |
| 5 | 88 |  |  |  |  |  |  |  |  | ．871 |  |  | 74 |  |  |  | 810 | 827 |  |  | 58 |
| 59 |  |  |  |  |  |  |  |  | 878 | －86 | $3 \cdot 7732$ |  |  | 82 | 84 | 8588 | 875 | 893 |  |  | 59 |
| 60 | 8772 | 8761 | 874 | 873 | 872 | 8715 | 8704 | 8692 | 86 | 59.866 | 3.8371 | 8545 | 871 |  |  | 9242 | 9416 | 9590 | 9764 | 993 | 60 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 87 |  |  | 86 | 8663 | 8651 | 86 | 862 | 861 | 62.860 | 4.02 | 047 | 06 |  | 102 |  | 138 | 157 | 17 | 19 | 63 |
| 64 | 86 |  |  |  |  | 8630 |  |  |  |  |  |  | 130 |  |  | 185 | 204 | 223 |  |  | 64 |
| 65 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 251 | 270 |  |  |  | 65 |
| 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
|  | 86 | 861 |  |  |  | 8565 |  |  |  | 66．851 |  |  |  |  |  |  | 401 | 42 |  |  |  |
| 68 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 69 |  |  |  |  | 536 | 23 | 8510 | 849 | 84 | 68.84 | 4.41 | 432 | 452 | 472 | 492 | 5128 | 5328 | 55 |  |  | 69 |
| 70 | 85 | 855 | 8541 | 852 | 8515 | 8501 | 8488 | 8474 | 8461 | 69．844 | 4.476 | 4969 | 517 | 53 | 5579 | 578 | 5985 |  | 6392 | 659 | 70 |
| 7 | 85 | 8533 | 852 | 850 | 8493 | 8480 | 8466 |  |  |  |  |  | 518 | 602 |  |  | 664 | 685 |  |  |  |
|  |  |  |  |  |  |  |  |  |  | $71 \cdot 84$ |  |  | 646 | 667 |  |  | 729 |  |  |  | 72 |
| 73 | 850 | 84 | 8478 | 8465 | 8451 | 8437 | 8423 | 840 | 839 | $72 \cdot 838$ | ＋66 | 689 | 710 | 73 | 75 | 774 | 795 | 816 | 8380 | 859 | 73 |
| 74 | 848 | 84 |  |  |  | 1 |  |  |  | 73.835 |  | 539 | 715 |  | 8184 |  | － |  |  |  |  |
| 75 |  |  |  |  |  | 394 |  | 836 | 8351 | 74：833 | 4.79 | 818 | 839 | 861 | 883 | 905 | 927 | 948 | 9705 | 992 | 75 |
|  | 84 |  |  |  |  |  |  |  | 832 | 75.83 |  | 882 | 90 | 926 | 9486 | 970 | 9927 | 114 | ， |  | 76 |
| 77 | 842 | 84 | 83 | 8381 | 8366 | 83 | 83 | 832 |  | 76：82 |  | 94 | 969 | 99 | ＋137 | 036 | 058 | 080 |  | 125 | 77 |
|  | 843 |  |  |  |  | 8330 | ， |  |  | 77－827 |  | ， | 03 | 05 | 0788 | 1614 | 18 | 14 | 132 |  | 78 |
| 79 | 8383 | 836 | 835 | 83 | 8324 | 8309 | 829 | 827 | 8263 | 78．824 | 5.0522 | 075 | 098 | 12 | 1439 | 168 | 1898 | 212 | 235 | 25 | 79 |
| 80 | 8362 | 834 | 8332 | 8317 | 8302 | 8287 | 8272 | 825 | 8241 | 79.822 |  | 1394 | 1626 | 185 | 2090 | 232 | 235 | 年 | ， | ， | 80 |
| 81 | 832 |  |  |  |  |  |  |  |  |  |  |  | 27 |  |  |  |  |  |  |  |  |
| 82 | 832 | －3206 | 8291 | 8275 | 8260 | 8244 | 8229 | 8213 | 8197 | 81.8181 | 5.24 | 267 | 2916 | 315 | 339 | 363 | 386 | 410 | 4345 | 45 | 82 |
| 83 | 830 | 8285 | 8270 | 54 | 8239 | 8223 | 8207 | 8191 | 817 | 82.81 |  | 332 | 356 | 38 | 40 | 428 | 4526 | 476 | 5007 |  | 83 |
| 84 | 8281 |  | 220 | ， | 8217 | 8201 |  | 8169 | 8153 | 8， | 5719 |  | 420 | 445 | 26 | 493 | 518 | 54 |  |  | 84 |
| 85 | 8260 | 824 | 822 | 8212 | 96 | 8180 |  | 8148 | 8131 | $84 \cdot 811$ | 5.4359 | 4606 | 4852 | 5099 | 5346 | 5593 | 5839 | 6086 | 63 | 657 | 85 |
| 86 | 82 | 82 | 8207 | 8191 | 8175 | 81 | 81 | 8126 | 8109 | $85 \cdot 80$ |  | 5248 | 549 | 57 | 5997 | 624 | 6496 | 674 | 6996 | 724 | 86 |
|  | 82 |  | 8187 |  | 8154 | 8137 | ， | 8104 | ， | 86．807 |  | 589 | 6143 | 639 | 664 | 6901 | 715 | 740 |  |  |  |
| 88 | 819 | 81 | 8166 | 8149 | 8133 | 8116 | 809 | 808 | 806 | 87－804 | $5 \cdot 627$ | 6533 | 678 | 704 | 72 | 7555 | 781 | 806 | 83 | 85 | 8 |
| 89 | 817 | 8162 | 8145 | 8128 | 8111 | 8094 | 80.8 | 8060 | 8 | 88.802 | 5.7557 | 7175 | 743 | 769 |  | 820 | 8467 | 872 |  | 24 |  |
| 90 | 8158 | 814 | 22 |  |  | 8073 | 8056 | 8039 |  | 89•800 | 5.7557 | 7818 | 807 | 834 | 8602 | 8863 | 9124 | 938 | 964 | 研 | 90 |
|  |  |  |  |  |  | 80 | 8034 | 8017 |  |  | 5.8196 | 8460 | 8724 | 89 | 9253 | 951 | 978 | －70 |  |  | 91 |
| 92 | 811 | 810 | 808 |  | 48 | 80 | 8013 | 7995 | 7977 | 9179 |  | 9103 | 9370 | 963 | 9904 | －171 | 0438 | 070 | 09 | 123 | 92 |
| 93 | 8096 | 807 |  | 4 |  | 8009 | 7991 | 7973 | 7953 | 92－793 | 5917 | 9745 | －015 | 028 | 05 | 0825 | 1095 | 136 | 163 | 190 | 93 |
| 94 | 8076 | 805 |  | 23 | 005 | 7987 | 7970 | 795 | 7933 | 93•791 | 6.0 | 0387 | 0660 | 093 | 120 | 1479 | 1752 | 202 | 229 |  | 94 |
| 95 | 8055 | 803 |  | 8002 | 7984 | 7966 |  |  | 7911 | 89 | 6.0754 | 1030 | 1306 | 1581 | 1857 | 2133 | 2409 | 2684 | 2960 |  | 95 |
| 9 | 80 |  |  |  |  | 7945 |  | 7908 | 7889 |  |  | 16 | 1951 | 22 | 2508 | 27 | 仡 | ， |  |  | 96 |
|  | 801 | 8996 | 797 |  |  | 7923 | 7905 | 7886 | 7867 | 97 | 6.2033 | 2315 | 2596 |  | 3160 | 3441 | 3723 | 4004 |  |  |  |
|  | 795 | 797 | 79 | 793 | 7920 | 790 | 7883 | 78 | 45 | 97.782 | 6. | 2957 | 324 | 35 | 3811 | 409 | 4380 | 4664 | 4948 | 5233 | 98 |
|  | 73 | 7955 | 7936 | 18 | 㖪 | 析 |  | 析 | 2323 | 987804 | 6 | 660 |  | 47 | 446 | 474 |  |  |  |  | 99 |
| 100 | 953 | 7934 | 7916 | 7897 | 7878 | 7859 | 7840 | 7821 | 7802 | 99．778 | 6.3952 | 4242 | 4532 | 4823 | 5113 | 5403 | 5693 | 5984 | 6274 | 6564 | 100 |
|  | $20^{\prime}$ | 19 | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ | $13^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ |  | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | 16 | 15 | 14 | $13^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | NE． |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $4^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $4^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | $1^{\prime}$ | $2^{\prime}$ | $3^{\text {r }}$ | $4^{\prime}$ | $5^{\prime}$ | $6^{\prime}$ | $7{ }^{\prime}$ | $8^{\prime}$ | $9^{\prime}$ | $0^{\prime}$ | $1^{\prime}$ | $2^{\prime}$ | $3^{\prime}$ | $4^{\prime}$ | － | 6 | 7 | 8 | $9^{\prime}$ |  |
|  | 9976 | 9975 | 997 | 9975 | 9975 | 9975 | 9974 | 9974 | 9974 | 997 | 0698 | 0700 | 0703 | 0706 | 0709 | 0712 | 0715 | 0718 | 072 | 24 |  |
| 2 | 9951 | 9951 | 9950 | 9950 | 9950 | 994 | 9949 | 99 | 9948 | 1.9948 | 1395 | 140 | 1407 | 14 | 1418 | 14 | 1430 | 1436 | 1442 | 1447 |  |
| 3 | 9927 | 992 | 9926 | 9925 | 9924 | 9924 | 9923 | 9923 | 9922 | $2 \cdot 992$ | 2093 | 2101 | 2110 | 2119 | 2128 | 2136 | 2145 | 2154 | 216 | 217 | 3 |
|  | 9903 | 9902 | 9901 | 9900 | 9899 | 9898 | 9898 | 9897 | 9896 | 3.989 | 2790 | 2802 | 2813 | 2825 | 2837 | 2848 | 2860 | 2872 | 28 | 289 |  |
| 5 | 9878 | 9877 | 9876 | 9875 | 9874 | 9873 | 9872 | 987 | 9870 | 4.9 | 3488 | 3502 | 3517 | 3531 | 3546 | 356 | 3575 | 3589 | 360 | 361 |  |
| 6 | 54 | 53 | 9851 | 98 | 9849 | 9848 | 98 | 9845 | 9844 | 5.9843 | 4185 | 4203 | 42 | 42 | 4255 | 427 | 42 | 430 | 43 | 4342 | 6 |
| 7 | 9829 | 982 | 982 | 982 | 9824 | 9822 | 982 | 981 | 9818 | 6.98 | 883 | 490 | 4924 | 4944 | 4964 | 498 | 50 | 5025 | 5045 | 506 | 7 |
| 8 | 9805 | 9803 | 9802 | 9800 | 9799 | 9797 | 9795 | 9794 | 9792 | 7.9790 | 5581 | 560 | 562 | 5650 | 5673 | 5697 | 5720 | 5743 | 5766 | 5789 |  |
|  | 978 | 9779 | 9777 | 9775 | 9773 | 9772 | 9770 | 9768 | 9766 | 8.976 | 6278 | 6304 | 6330 | 6356 | 6383 | 6409 | 6435 | 6461 | 6487 | 651 |  |
| 10 | 9756 | 9754 | 9752 | 9750 | 9748 | 9746 | 9744 | 9742 | 9740 | 9.9738 | 6976 | 7005 | 7034 | 7063 | 7092 | 7121 | 7150 | 7179 | 7208 | 7237 | 10 |
| 11 | 97 | 9730 | 97 | 9725 | 9723 | 9721 | 97 | 9716 | 9714 | 10 | 73 | 7705 | 77 | 77 | 780 | 78 | 7865 | 7897 | 7929 |  | 11 |
| 12 | 9708 | 9705 | 9703 | 9700 | 9698 | 9695 | 9693 | 969 | 9688 | 11.9685 | 8371 | 840 | 84 | 84 | 8510 | 8545 | 8580 | 8615 | 8649 | 8684 | 12 |
| 13 | 9683 | 9681 | 9678 | 9675 | 9673 | 9670 | 9667 | 9665 | 9662 | 12.9659 | 9068 | 910 | 9144 | 9182 | 921 | 92 | 92 | 93 | 937 | 940 | 13 |
| 14 | 965 | 9656 | 9653 | 9650 | 48 | 9645 | 9642 | 9639 | 9636 | 13.9633 | 766 | 9807 | 9847 | 9888 | 9928 | 99 | －010 | 0050 | 009 | 0131 | 14 |
| 15 | 9635 | 32 |  | 9625 |  |  | 9616 | 9613 | 610 | 14．9607 | 63 | 0507 | 0551 | 0594 | 0638 | 068 | 0725 | 0768 | 081 | 985 | 15 |
| 16 | 96 | 9607 | 504 | 960 | 9597 | 9594 | 959 | 9587 | 9584 | 15.9580 | 161 | 1207 | 12 | 1300 | 13 | 1393 | 1440 | 148 | 15 | 1579 | 16 |
| 17 | 9586 | 9582 | 9579 | 9575 | 9572 | 9568 | 9565 | 95 | 95 | 16.95 | $1 \cdot 1859$ | 190 | 195 | 2007 | 2056 | 210 | 21 | 2204 | 225 | 23 | 17 |
| 18 | 9562 | 9558 | 9554 | 9551 | 9547 | 9543 | 9539 | 9536 | 9532 | 17.952 | $1 \cdot 2556$ | 2608 | 2661 | 2713 | 2765 | 2817 | 2870 | 2922 | 297 | 302 | 18 |
| 19 | 9537 | 9533 | 9529 | 9526 | 9522 | 9518 | 514 | 9510 | 506 | 18.950 | $1 \cdot 3254$ | 3309 | 3364 | 3419 | 3474 | 352 | 358 | 3640 | 369 | 37 | 19 |
| 20 | 9513 | 9509 | 9505 | 9501 | 9496 | 9492 | 9488 | 9484 | 9480 | 19.9476 | $1 \cdot 3951$ | 4009 | 4067 | 4125 | 4183 | 424 | 4299 | 4358 | 4416 | 4474 | 20 |
| 21 | 9488 | 9484 | 948 | 947 | 9471 | 9467 | 946 | 945 | 9454 | 20.944 | 4649 | 471 | 477 | 48 | 4893 | 495 | 5014 | 5075 | 5136 |  | 21 |
| 22 | 9464 | 9460 | 94 | 9451 | 46 | 442 | 943 | 943 | 28 | 21.9123 | 5346 | 5410 | 547 | 5538 | 5602 | 56 | 5729 | 579 | 5857 | 592 | 22 |
| 23 | 9440 | 9435 | 943 | 9426 | 9421 | 9416 | 94 | 9407 | 402 | 22.9397 | 1.604 | 611 | 617 | 624 | 631 | 637 | 64 | 651 | 657 | 664 | 23 |
| 24 | 941 | 9410 | 940 | 94 | 9396 | 9391 | 93 | 9381 | 9376 | 23.937 | 1.6742 | 6811 | 6881 | 6950 | 7020 | 709 | 7159 | 7229 | 729 | 7368 | 24 |
| 25 | 93 | 9386 | 9381 | 9376 | 9371 | 9365 |  |  |  |  | 1.7439 | 7512 | 7584 | 657 | 7729 | 780 | 7874 | 794 | 80 | 8092 | 25 |
| 26 | 9367 | 361 | 9356 | 9351 | 9345 | 40 | 9335 | 93 | 9324 | 25．931 | 1.8137 | 8212 | 828 | 83 | 843 | 85 | 8589 | 866 | 874 | 8816 | 26 |
| 27 | 9342 | 9337 | 9331 | 932 | 9320 | 9315 | 9309 | 930 | 9298 | 26.92 | 1.8834 | 8913 | 89 | 90 | 91 | 92 | 93 | 93 | 946 |  | 27 |
| 28 | 9318 | 9312 | 930 | 930 | 9295 | 9289 | 9283 | 9278 | 9272 | 27.926 | 1.9532 | 9613 | 9694 | 9776 | 9857 | 99 | －019 | 010 | 018 | 0263 | 28 |
| 29 | 9294 | 9288 | 9282 | 9276 |  | 9264 | 9258 | 92 | 9246 | 28.924 | 2.0229 | 0314 | 0398 | 0482 | 0566 | 065 | 07 | 081 | 090 | 0987 | 29 |
| 30 | 9269 | 9263 | 9257 | 9251 | 9245 | 9238 | 9232 | 9226 | 9220 | 29.9213 | 2.0927 | 1014 | 1101 | 1188 | 127 | 136 | 1449 | 153 | 162 | 1710 | 30 |
| 31 | 9245 | 9239 | 9232 | 9226 | 9219 | 9213 | 9207 | 9200 | 9194 | $30 \cdot 9187$ | 2．1625 | 1714 | 804 | 1894 | 1984 | 2074 | 64 | 2254 | 2344 | 2434 | 31 |
| 32 | 92 | 14 | 920 | 92 | 94 | 9188 | 9181 | 9174 | 68 | 31.916 | $2 \cdot 2322$ | 2415 | 2508 | 2601 | 2693 | 2786 | 2879 | 297 | 306 |  | 32 |
| 33 | 9196 | 9189 | 918 | 917 | 69 | 916 | 915 | 9149 | 9142 | 32.913 | $2 \cdot 3020$ | 3115 | 321 | 330 | 3403 | 349 | 3594 | 369 | 37 | 388 | 33 |
| 34 | 9172 | 9165 | 9158 | 91 | 9144 | 9137 | 91 | 9123 | 9116 | 33.910 | $2 \cdot 3717$ | 381 | 3915 | 4013 | 411 | 4210 | 43 | 4408 | 450 | 46 | 34 |
| 35 | 91 | 9140 | 9133 | 9126 | 9119 | 9112 | 9104 | 9097 | 9090 | 34. | 2.4415 | 4516 | 4618 | 4719 | 482 | 4923 | 5024 | 512 | 522 | 5329 | 35 |
| 36 | 9123 | 9116 | 9108 | 910 | 9094 | 9086 | 907 | 9071 | 64 | 35.905 | 51 | 521 | 53 | 542 | 55 | 56 | 5739 | 5844 | 5948 | 6052 | 36 |
| 37 | 9099 | 9091 | 9084 | 907 | 9068 | 9061 | 905 | 9045 | 9038 | $36 \cdot 90$ | 2.5 | 591 | 60 | 61 | 62 | 63 | 6454 | 6561 | 666 | 67 | 37 |
| 38 | 9074 | 9067 | 9059 | 90 | 9043 | 9035 | 9028 | 9020 | 9012 | 37－900 | 2.6507 | 6618 | 6728 | 6838 | 6948 | 705 | 7169 | 727 | 73 | 7500 | 38 |
| 39 | 9050 | 9042 | 9034 | 9026 | 9018 | 9010 | 9002 | 8994 | 8986 | 38．897 | 2.7205 | 7318 | 7431 | 7545 | 7658 | 777 | 7884 | 799 | 811 | 82 | 39 |
| 40 | 9026 | 9017 | 9009 | 9001 | 8993 | 8985 | 8976 | 8968 | 8960 | 39＇895 | 2.7903 | 8019 | 8135 | 825 | 836 | 8483 | 859 | 871 | 883 | 89 | 40 |
| 41 | 9001 | 8993 | 8985 | 8976 | 8968 | 8959 | 8951 | 8942 | 8934 | 40.8925 | 2.8600 | 8719 | 8838 | 8957 | 9076 | 9195 | 9314 | 9433 | 9552 | 9671 | 41 |
| 42 | 897 | 68 | 8960 | 8951 | 43 | 34 | 25 | 8916 | 8908 | 41. | 2.9298 | 9420 | 95 | 9663 | 78 | 9907 | ＋029 | 01 | 027 | 0394 | 42 |
| 43 | 8953 | 8944 | 8935 | 8926 | 8917 | 8908 | 8900 | 88 | 8882 | 42.887 | 2.99 | －12 | 02 | 03 | 04 | 06 | 0744 | 08 | 099 |  | 43 |
| 44 | 8928 | 8919 | 8910 | 8901 | 8892 | 8883 | 8874 | 8865 | 8856 | 43.884 | 3.06 | 08 | 0948 | 107 | 120 | 13 | 1459 | 158 | 17 | 1842 | 44 |
| 45 | 89 | 8895 | 8885 | 8876 | 8867 | 8858 | 8848 | 8839 | 8830 | 44．8820 | $3 \cdot 1390$ | 1521 | 1652 | 178 | 191 | 2043 | 217 | 230 | 24 | 25 | 45 |
| 46 | 887 | 8870 | 886 | 88 | 8842 | 8832 | 882 | 8813 | 8804 | $45 \cdot 8$ | 20 | 22 | 2355 | 248 | 262 | 2755 | 2889 | 302 | 315 | 3289 | 46 |
| 47 | 8855 | 8846 | 883 | 882 |  | 8807 | 879 | 87 | 87 | 46.8 | 3.27 | 29 |  | 319 | 333 | 3467 | 3604 | 374 |  |  | 47 |
| 48 | 8831 | 8821 | 8811 | 8801 | 8791 | 8782 | 8772 | 8762 | 8752 | 47.874 | 3.348 | 362 | 376 | 390 | 4040 | 4180 | 4319 | 445 | 459 | 4 | 48 |
| 49 | 8806 | 8796 | 8786 | 8776 | 8766 | 8756 | 8746 | 8736 | 8726 | 48.871 | 3.4181 | 4323 | 4465 | 4607 | 4749 | 4892 | 5034 | 5176 | 5318 | 54 | 49 |
| 50 | 8782 | 8772 | 8762 | 8751 | 8741 | 8731 | 8720 | 8710 | 8700 | 49.8689 | 3＇4878 | 5023 | 5168 | 5314 | 5459 | 5604 | 5749 | 5894 | 6039 | 6184 | 50 |
| 51 | 8758 | 8747 | 87 | 8726 | 8716 | 87 | 8695 | 8684 | 8673 | 50 | 3．5576 | 57 | 58 | 6020 | 6168 | 6316 | 6464 | 6612 | 6760 |  | 51 |
| 52 | 8733 | 23 | 8712 | 8701 | 8691 | 8680 | 8669 | 8658 | 8647 | 51.86 | 3.6273 | 6424 | 6575 | 672 | 6877 | 7028 | 7179 | 733 | 748 | 763 | 52 |
| 53 | 8709 | 8698 | 8687 | 8676 | 8666 | 8655 | 8644 | 8633 | 862 | 52.86 | 3.69 | 71 | 7279 | 743 | 7586 | 7740 | 7894 | 80 | 82 | ， | 53 |
| 54 | 8685 | 8674 | 8663 | 8652 | 8640 | 8629 | 8618 | 8607 | 8595 | 53.858 | 3.76 | 78 | 7982 | 813 | 829 | 8452 | 860 | 87 | 8922 | 9079 | 54 |
| 55 | 8660 | 8649 | 8638 | 8627 | 8615 | 8604 | 8592 | 81 | 8569 | $54 \cdot 85$ | $3 \cdot 8366$ | 8526 | 685 | 8845 | 900 | 916 | 932 | 48 | 9643 | 9802 | 55 |
| 56 | 8636 | 862 | 8613 | 8602 | 90 | 857 | 8567 | 8555 | 8543 | 55.85 | 3.9064 | 92 | 93 | 955 | 9714 | 9876 | ＋039 | 020 | 036 | 0526 | 56 |
| 57 | 8612 | 8600 | 8588 | 857 | 8565 | 855 | 8541 | 85 | 8517 | 56. | 3.97 |  | －0 | 025 | 0423 | 0588 |  |  | 108 |  | 57 |
| 58 | 858 | 8575 | 8564 | 8552 | 8540 | 8528 | 516 | 504 | 8491 | 57•84 | 4.0459 | 0627 | 0795 | 0964 | 1132 | 1300 | 1468 | 163 | 180 | 1973 | 58 |
| 59 | 8563 | 8551 | 8539 | 8527 | 851 | 850 | 8490 | 8478 | 8465 | 58.8453 | 4.115 | 13 | 1499 | 1670 | 18 | 2012 | 2183 | 235 | 2526 | 26 | 59 |
| 60 | 8538 | 8526 | 8514 | 8502 | 8489 | 8477 | 8464 | 8452 | 8439 | $59 \cdot 8427$ | $4 \cdot 1854$ | 2028 | 2202 | 2376 | 2550 | 2724 | 2898 | 3073 | 3247 | 3421 | 60 |
| 61 | 85 | 8502 | 8489 | 77 | 8464 | 845 | 8439 | 26 | 8413 | $60 \cdot 8$ | 2551 | 2728 | 2905 |  | 32 | 3436 | 3613 |  | 396 |  | 61 |
| 62 | 8490 | 8477 | 8464 | 52 | 439 | 8426 | 13 | 00 | 8387 | 61.837 | 4324 | 3429 | 3609 | 378 | 3969 | 4149 | 4328 | 450 | 468 | 486 | 62 |
| 63 | 8465 | 8453 | 8440 | 427 | 8414 | 840 | 8388 | 8375 | 836 | 62.834 | $4 \cdot 3947$ | 4129 | 4312 | 4495 | 467 | 4861 | 5043 | 52 | 54 |  | 63 |
| 64 | 8441 | 8428 | 8415 | 402 | 8389 | 8375 | 8362 | 8349 | 8335 | 63＇8322 | 4.4644 | 4830 | 5016 | 5201 | 5387 | 5573 | 5758 |  | 6130 | 硣 | 64 |
| 65 | 8417 | 8403 | 8390 | 377 | 363 | 8350 | 8337 | 323 | 8309 | 64．829 | 4.5342 | 5530 | 571 | 590 | 609 | 628 | 6473 | 6662 | 685 | 703 | 65 |
| 66 | 8392 | 837 | 836 | 352 | 8338 | 832 | 311 | 8297 | 828 | 65.826 | 4.6039 | 6231 | 6422 | 6614 | 68 | 69 | 寿8 | 738 | 757 |  | 66 |
| 67 | 8368 | 8354 | 8341 | 8327 | 8313 | 82 | 8285 | 8271 | 8257 | 66.824 | 46737 | 6931 | 71 | 732 | 75 | 77 | 7903 | 808 | 829 |  | 67 |
| 68 | 8319 | 833 | 8316 |  |  | 82 | 8260 | 246 | 8231 | 67．821 | 4.7434 | 7632 | 829 | 8026 | 8224 | 8421 | 8618 | 881 | 901 | 析 | 68 |
| 69 | 8319 | 8305 | 8291 | 8277 | 8263 | 8248 | 8234 | 8220 | 8205 | 68.819 | 4.8132 | 8332 | 8532 | 8733 | 8933 | 9133 | 9333 | 953 | 973 | 993 | 69 |
| 70 | 8295 | 8281 | 8266 | 8252 | 8238 | 8223 | 8209 | 8194 | 8179 | 69.8165 | $4 \cdot 8830$ | 9033 | 9236 | 9439 | 9642 | 9845 | ． 04 | 025 | 045 | 6 | 70 |
| 71 | 8271 | 8256 | 8242 | 8227 | 8212 | 8198 | 8183 | 8168 | 8153 | 70.813 | 4．9527 | 9733 | 9939 | ＋14 | 0351 | 0557 | 163 |  |  |  | 71 |
| 72 | 8246 | 8231 | 8217 | 202 | 8187 | 8172 | 8157 | 8142 | 812 | 71.811 | 5.02 | 0434 | 0642 | 0851 | 1060 | 1269 | 1478 | 168 | 189 | 210 | 72 |
| 73 | 8222 | 8207 | 8192 | 8177 | 8162 | 8147 | 8132 | 8117 | 8101 | 72.8086 | 5.0922 | 1134 | 1346 | 1558 | 1769 | 1981 | 2193 | 240 | 261 | 2828 | 73 |
| 74 | 8197 | 8182 | 8167 | 8152 | 8137 | 8122 | 8106 | 8091 | 8075 | $73 \cdot 8060$ | 5．1620 | 1835 | 2049 | 2264 | 2479 | 2693 | 290 |  | 333 | 325 | 析 |
| 75 | 8173 | 815 | 8142 | 8127 | 8112 | 8096 | 8081 | 8065 | 8049 | 74：803 | 5.231 | 2535 | 275 | 297 | 3188 | 3405 | 362 | 384 | 405 | 427 | 75 |
| 76 | 8149 | 8133 | 18 | 102 | 8086 | 807 | 8055 | 8039 | 8023 | 75.800 | $5 \cdot 30$ | 3235 | 3456 | 367 | 3897 | 4118 | 4338 | 4559 | 4779 | 5000 | 76 |
| 77 | 8124 | 8109 | 8093 | 8077 | 8061 | 8045 | 8029 | 8013 | 7997 | $76 \cdot 798$ | 5.3713 | 3936 | 4159 | 438 | 4606 | 4830 | 5053 | 5276 | 550 | 57 | 77 |
| 78 | 8100 | 8084 | 806 | 252 | 803 | 829 | 8004 | 崖 | 797 | 77．7955 | 5.4410 | 4636 | 4863 | 589 | 5315 | 5542 | 578 | 5919 | 622 | 617 | 78 |
| 79 | 8076 | 8060 | 8043 | 8027 | 8011 | 7995 | 7978 | 7962 | 7945 | 78.7929 | 5.5108 | 5337 | 5566 | 5795 | 6025 | 6254 | 6483 | 6712 | 694 | 717 | 79 |
| 80 | 8051 | 35 | 8019 | 8002 | 7986 | 7969 | 7953 | 7936 | 7919 | 79.7902 | 5.5805 | 6037 | 6269 | 6502 | 6734 | 6966 | 719 | 7430 | 76 | 789 | 80 |
| 81 | 8027 | 8010 | 7994 | 7977 | 7961 | 7944 | 7927 | 7910 | 7893 | 80.787 | 5.650 | 6738 | 6973 | 720 | 7443 | 7638 | 7913 | 818 |  |  | 81 |
| 82 | 8003 | 7986 | 7969 | 7952 | 7935 | 7918 | 7901 | 㖪 | 7867 | 81.7850 | 5.7200 | 7438 | 7676 | 7914 | 8152 | 8390 | 8628 | 8866 | 9104 | 934 | 82 |
| 83 | 7978 | 7961 | 7944 | 7927 | 7910 | 7893 | 7876 | 7859 | 7841 | 82.7824 | 5.7898 | 8139 | 8380 | 8620 | 8861 | 9102 | 9343 | 958 | 9824 | ＋065 | 83 |
| 84 | 7954 | 7937 | 析 | 7902 | 7810 | 7868 | 785 | 33 | 7815 | $83 \cdot 7798$ | 5.859 | 8839 | 9083 | 932 | 957 | 981 | －058 | 0302 | 054 | 0789 | 84 |
| 85 | 7929 | 7912 | 7895 | 7877 | 786 | 7842 | 82 | 7807 | 778 | 84.777 | 5.9293 | 9540 | 9786 | ＋03 | 028 | 052 | 077 | 101 | 126 | 1513 | 85 |
| 86 | 7905 | 7888 | 870 | 7852 | 7835 | 7817 | 17799 | 7781 | 7763 | 85.7745 | 5.9991 | \＄240 | 0490 | 0739 | 0989 | 1238 | 1488 | 1737 | 1987 | 223 | 86 |
| 87 | 7881 | 7863 | 7845 | 7827 | 7810 | 7792 | 7773 | 7755 | 7737 | 86.7719 | 6.0688 | 0941 | 1193 | 144 | 1698 | 1950 | 2203 | 245 | 270 | 296 | 87 |
| 88 | 7856 | 7838 | 7821 | 7802 | 7784 | 7766 | 7748 | 7730 | 7711 | 87.769 | 6.1386 | 1641 | 1896 | 215 | 2407 | 2662 | 2918 | 3173 | 3428 | 8680 | 88 |
| 89 | 7832 | 7814 | 7796 | 7777 | 7759 | 7741 | 7722 | 7704 | 7685 | 88.7666 | 6.2083 | 2342 | 2600 | 285 | 3116 | 3374 | 3633 | 389 | 4149 | 440 | 89 |
| 90 | 7808 | 7789 | 7771 | 7753 | 7734 | 7715 | 7697 | 7678 | 7659 | 89.7640 | 6.2781 | 304 | 330 | 356 | 3825 | 4087 | 4348 | 4609 | 48 | 513 | 90 |
| 91 | 7783 | 7765 | 7746 | 7728 | 7709 | 7690 | 7671 | 762 | 7633 | 90.761 | $6 \cdot 3478$ | 3742 | 4006 | 427 | 4535 | 4799 | 5063 | 532 | 5591 | 5 |  |
| 92 | 7759 | 7740 | 7721 | 7703 | 7684 | 7665 | 7646 | 7626 | 7607 | 91.7588 | 6.4176 | 4443 | 4710 | 4977 | 5244 | 5511 | 5778 | 6045 | 6311 | 657 | 9 |
| 93 | 7735 | 7716 | 7697 | 7678 | 7658 | 7639 | 7620 | 7601 | 7581 | 92．7562 | 6.4874 | 5143 | 5413 | 5683 | 5953 | 6223 | 6493 | 6762 | 703 | 7302 | 93 |
| 94 | 7710 | 7691 | 7672 | 553 | 矿 | 7614 | 源 | 575 | 7555 | 93.7535 | 6.5571 | 5844 | 617 | 638 | 6662 | 6935 | 7208 | 74 | 775 | 802 | 星 |
| 95 | 7686 | 7667 | 7647 | 628 | 7608 | 7588 | 7569 | 7549 | 7529 | 94.7509 | 6.6269 | 6544 | 6820 | 7096 | 73 | 64 | 7923 | 8198 | 8474 | 874 | 95 |
| 96 | 7662 | 7642 | 7622 | 7603 | 7583 | 7563 | 7543 | 7523 | 7503 | 95.7483 | 6.6966 | 7245 | 7523 | 7802 | 8080 | 8359 | 8638 | 8916 | 919 | 9473 | 96 |
| 97 | 7637 | 7617 | 7598 | 7578 | 7558 | 7538 | 7518 | 7497 | 7477 | 96.7457 | 6.7664 | 7945 | 8227 | 8508 | 8790 | 9071 | 9352 | 963 | 9915 | ＋197 | 97 |
| 98 | 7613 | 7593 | 7573 | 7553 | 7533 | 7512 | 7492 | 7472 | 7451 | 97.7430 | 6.8361 | 8646 | 8930 | 9214 | 9499 | 9783 | －067 | 0352 | 0636 | 0920 | 98 |
| 99 | 7588 | 7568 | 7548 | 7528 | 7507 | 7487 | 7466 | 7446 | 7425 | 98．7404 | 6.9059 | 9346 | 9633 | 992 | －208 | 0495 | 0782 | 1070 | 1357 | 1644 | 99 |
| 100 | 7564 | 7544 | 523 | 7503 | 482 | 7462 | 7441 | 7420 | 7399 | 99.7378 | 6.9757 | －047 | 0337 | 0627 | 0917 | 1207 | 1497 | 1788 | 2078 | 2368 | 100 |
|  | $60^{\prime}$ | $59^{\prime}$ | $58^{\prime}$ | $57^{1}$ | $56^{\prime}$ | $55^{\prime}$ | $54^{\prime}$ | $53^{\prime}$ | $52^{\prime}$ | $51^{1}$ | $60^{\prime}$ | $59^{\prime}$ | 58 | ［ $57{ }^{\prime}$ | $56^{\prime}$ | $55^{\prime}$ | $54^{\prime}$ | 53 | $52^{\prime}$ | $51^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Cos | SINE． |  |  |  |  |  |

TRAVERSE TABLES．

| $4^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $4^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime} \mid$ | 11＇1 | ｜ $12^{\prime}$｜ | ｜ $13^{\prime}$｜ | $14^{\prime} 1$ | $15^{\prime}$ | $16^{\prime \prime}$ | 17＇1 | ｜18＇ | ｜19＇ | $10^{i}$ | $11^{\prime} 1$ | ｜ $12{ }^{\prime}$ | $13^{\prime}$ | ｜ $14^{\prime}$｜ | $\left.\frac{15}{15} \right\rvert\,$ | $16^{\prime}$ | $\left\|17^{\prime}\right\|$ | 18＇ |  |  |
|  | 9974 | 9973 | 9973 | 9973 | 9973 | 9973 | 9972 | 9972 | 9972 | ．9972 | 072710 | 0729 | 0732 | 0735 | 0738 |  | 0744 | 0747 | 0750 | 0753 |  |
| 2 | 9947 | 9947 | 9946 | 9946 | 9945 | 9945 | 9945 | 9944 | 9944 | 1.9943 | 1453 | 1459 | 1465 | 1471 | 1476 | 1482 | 1488 | 1494 | 1500 | 1505 |  |
| 3 | 9921 | 9920 | 9919 | 9919 | 9918 | 9918 | 9917 | 9916 | 9916 | 2.9915 | 2180 | 2188 | 2197 | 2206 | 2215 | 2223 | 2232 | 2241 | 2249 | 2258 |  |
| 4 | 9894 | 9893 | 9893 | 9892 | 9891 | 9890 | 9889 | 9888 | 9887 | 3.9887 | 2906 | 2918 | 2930 | 2941 | 2953 | 2964 | 2976 | 2988 | 2999 | 30 |  |
| 5 | 9868 | 9867 | 66 | 9865 | 64 | 9863 | 986 | 9860 | 9859 | 4.98 | 36 | 647 | 3662 | 3676 | 3691 | 3705 | 3720 | 373 | 3749 | 3763 |  |
| 6 | 9841 | 9840 | 9839 | 98 | 9836 | 9835 | 9834 | 9832 | 9831 | 5.9830 | 4359 | 4377 | 4394 | 4412 | 4429 | 4447 | 4464 | 4481 | 4499 | 4516 |  |
| 7 | 9815 | 9813 | 9812 | 9811 | 9809 | 9808 | 980 | 9804 | 9803 | 6.9801 | －5086 | 5106 | 5127 | 5147 | 5167 | 5188 | 5208 | 5228 | 5249 | 5269 |  |
| 8 | 9789 | 9787 | 9785 | 9783 | 9782 | 9780 | 9778 | 9777 | 9775 | 7.9773 | ． 5813 | 5836 | 5859 | 5882 | 5905 | 5929 | 5952 | 5975 | 5998 | 6022 |  |
|  | 9762 | 9760 | 9758 | 9756 | 9754 | 9753 | 9751 | 9749 | 9747 | 8.9745 | 6539 | 6565 | 6591 | 6618 | 6644 | 6670 | 6696 | 6722 | 6748 | 6774 |  |
| 10 | 9736 | 9734 | 9731 | 9729 | 9727 | 9725 | 9723 | 9721 | 9719 | 9.9716 | 7266 | 7295 | 7324 | 7353 | 7382 | 7411 | 7440 | 7469 | 7498 | 7527 | 10 |
| 11 | 9709 | 9707 | 9705 | 9702 | 9700 | 9698 | 9695 | 9693 | 9690 | 10.968 | 7992 | 8024 | 805 | 8088 | 81 | 152 | 8184 | 8216 | 8248 | 8280 | 1 |
| 12 | 9683 | 9680 | 9678 | 9675 | 73 | 9670 | 9667 | 9665 | 9662 | 11.9660 | －8719 | 8754 | 8789 | 8823 | 8858 | 8893 | 8928 | 8963 | 8997 | 9032 | 1 |
| 13 | 9656 | 654 | 9651 | 9648 | 9645 | 9643 | 9640 | 9637 | 9634 | 12.9631 | 9446 | 9483 | 9521 | 9559 | 9596 | 9634 | 9672 | 9710 | 9747 | 9785 | 13 |
| 14 | 9630 | 9627 | 9624 | 9621 | 9618 | 9615 | 9612 | 9609 | 9606 | 13.9603 | ． 0172 | 0213 | 0253 | 0294 | 0335 | 0375 | 0416 | 0456 | 0497 | 0538 | 14 |
| 15 | 04 | 600 | 9597 | 94 | 9591 | 88 | 584 | 958 | 9578 | 14．9574 | 99 | 0942 | 0986 | 102 | 1073 | 1116 | 116 | 120 | 1247 | 129 | 15 |
| 16 | 9577 | 9574 | 9570 | 95 | 63 | 60 | 95 | 9553 | 9550 | 15.9546 | 25 | 1672 | 171 | 176 | 1811 | 1857 | 1904 | 1950 | 1997 | 2043 |  |
| 17 | 9551 | 954 | 9543 | 9540 | 9536 | 9533 | 9529 | 9525 | 952 | 16.951 | $1 \cdot 2352$ | 2401 | 2450 | 2500 | 2549 | 2598 | 2648 | 2697 | 46 |  | 7 |
| 18 | 9524 | 9520 | 9517 | 9513 | 09 | 9505 | 9501 | 9497 | 9493 | 17.9489 | 1.3078 | 3131 | 3183 | 3235 | 3287 | 3340 | 3392 | 3444 | 3496 | 3548 | 18 |
| 19 | 9498 | 9494 | 9490 | 86 | 9482 | 9478 | 9473 | 9469 | 9465 | 18.94 | 13805 | 3860 | 3915 | 3970 | 4025 | 4081 | 4136 | 4191 | 4246 | 430 | 19 |
| 20 | 9471 | 9467 | 9463 | 59 | 9454 | 50 | 46 | 9441 | 437 | 19.9433 | 14532 | 4590 | 4648 | 4706 | 4764 | 4822 | 4880 | 4938 | 4996 | 505 | 20 |
| 21 | 9445 | 944 | 9436 | 9432 | 9427 | 9423 | 94 | ， |  | 20.94 | 1.5258 | 5319 | 538 |  | 20 | 53 | 5624 | 5685 | 5746 | 5806 | 21 |
| 22 | 9419 | 14 | 94 | 9404 | 9400 | 9395 | 9390 | 9386 | 9381 | 21.937 | 1.5985 | 6049 | 6112 | 6176 | 6240 | 6304 | 636 | 6432 | 6495 | 65 | 2 |
| 23 | 9392 | 9387 | 938 | 9377 | 9372 | 9368 | 9363 | 9358 | 9353 | 22.9348 | 1.6711 | 6778 | 6845 | 6912 | 6978 | 7045 | 7112 | 7178 | 7245 | 73 | 23 |
| 24 | 936 | 9361 | 93 | 50 | 9345 | 9340 | 9335 | 9330 | 9324 | 23.9319 | 1.7438 | 7508 | 7577 | 7647 | 7716 | 7786 | 7856 | 7925 | 799 | 80 | 24 |
| 25 | 9339 | 34 | 93 |  |  | 13 | 9307 | 9302 | 9296 | 24.9291 | 1.8165 | 823 | 831 | 838 | 8455 | 852 | 86 | 867 | 87 | 8817 | 25 |
| 26 | 9313 | 307 | 9302 | 929 | 291 | 928 | 9279 | 9274 | 9268 | 25.926 | 1.8891 | 89 | 90 | 91 | 9193 | 9268 | 9344 | 94 | 9494 | 9570 |  |
| 27 | 9286 | 9281 | 9275 | 926 | 63 | 9258 | 9252 | 9246 | 9240 | 26.923 | 618 | 9696 | 9774 | 9853 | 9931 | 1009 | 0088 | 66 | 44 | 0323 | 27 |
| 28 | 9260 | 9254 | 9248 | 9242 | 236 | 9230 | 9224 | 9218 | 9212 | 27.920 | 2.0344 | 0425 | 0507 | 0588 | 0669 | 0750 | 0832 | 0913 | 099 | 1075 | 28 |
| 29 | 9234 | 922 | 9221 | 9215 | 9209 | 9203 | 9196 | 9190 | 9184 | 28.917 | 2．107 | 1155 | 1239 | 1323 | 1407 | 1491 | 1576 | 1660 | 1744 | 82 | 29 |
| 30 | 9207 | 9201 | 919 | 88 | 9182 | 9175 | 69 | 9162 | 9156 | 29.9149 | 2．1797 | 884 | 1971 | 2058 | 2146 | 2233 | 2320 | 2407 | 2494 | 258 | 30 |
| 31 | 9181 | 9174 | 9167 | 9161 | 9154 | 9148 | 9141 | 9134 | 9127 | 30.9121 | $2 \cdot 2524$ | 2614 | 2704 | 2794 | 2884 | 2974 | 3064 | 3153 | 3243 | 3333 | 31 |
| 32 | 9154 | 9147 | 9141 | 9134 | 9127 | 9120 | 9113 | 9106 | 9099 | $31 \cdot 909$ | $2 \cdot 325$ | 334 | 3436 | 3529 | 3622 | 3715 | 3808 | 3900 | 3993 | 40 | 32 |
| 33 | 9128 | 9121 | 9114 | 9107 | 100 | 9093 | 9085 | 9078 | 71 | 32.906 | 2．3977 | 4073 | 4169 | 4264 | 4360 | 4456 | 4552 | 4647 | 4743 | 4839 | 33 |
| 34 | 9101 | 9094 | 9087 | 9080 | 072 | 9065 | 9058 | 9050 | 9043 | 33.903 | $2 \cdot 4704$ | 4802 | 4901 | 5000 | 5098 | 5197 | 5296 | 5394 | 549 | 5s | 34 |
| 35 | 9075 | 9067 | 9060 | 9053 | 9045 | 388 | 9030 | 9022 | 9015 | 34．900 | 2.5430 | 5532 | 5633 | 5735 | 5836 | 5938 | 6040 | 6141 | 624 | 6344 | 35 |
| 36 | 9048 | 9041 | 903 | 26 | 9018 | 9010 | 9002 | 899 | 8987 | 35 ＇8979 | 2.6157 | 62 | 6366 | 6470 | 6575 | 66 | 6783 | 888 | 6992 | 7097 | 36 |
| 37 | 9022 | 901 | 90 | 8998 | 91 | 8983 | 975 | 67 | 58 | $36 \cdot 895$ | 6883 | 6991 | 098 | 7205 | 7313 | 7420 | 7527 | 635 | 774 | 7849 | 37 |
| 38 | 8996 | 8988 | 8980 | 8971 | 8963 | 8955 | 8947 | 8939 | 930 | 37－892 | $2 \cdot 7610$ | 7720 | 7831 | 794 | 805 | 816 | 827 | 3382 | 849 |  | 38 |
| 39 | 8969 | 8961 | 8953 | 8944 | 8936 | 8928 | 8919 | 8911 | 8902 | $38^{\circ} 8$ | 2.8337 | 8450 | 563 | 8676 | 8789 | 8902 | 9015 | 9129 | 924 | 9355 | 39 |
| 40 | 8943 | 8934 | 8926 | 8917 | 8909 | 8900 | 8891 | 8883 | 74 | 39•8865 | 2.9063 | 9179 | 9295 | 9411 | 9527 | 9643 | 9759 | 9875 | 999 | 110 | 40 |
| 41 | 8916 | 8908 | 88 | 8890 | 8881 | 8873 | 8864 | 8855 | 46 | 40.88 | 979 | 9909 | －028 | 0147 | 026 | 038 | 0503 | 0622 | 0741 | 08 | 41 |
| 42 | 8890 | 8881 | 8872 | 863 | 8854 | 8845 | 8836 | 8827 | 8818 | 41.88 | 3.05 | 0638 | 0760 | 0882 | 100 | 1126 | 1247 | 1369 | 149 | 16 | 42 |
| 43 | 8863 | 8854 | 8845 | 36 | 827 | 8818 | 808 | 8799 | 8790 | $42 \cdot 8780$ | $3 \cdot 1243$ | 13 | 1492 | 1617 | 1742 | 1867 | 1991 | 211 | 224 | 2366 | 43 |
| 44 | 8837 | 8828 | 8818 | 09 | 800 | 8790 | 8781 | 8771 | 8761 | $43 \cdot 8752$ | 3．1970 | 2097 | 2225 | 2352 | 2480 | 26 | 2735 | 2863 | 299 |  | 44 |
| 45 | 8811 | 8801 | 8792 | 8782 | 772 | 8763 | 8753 | 8743 | 8733 | 44.8723 | 3.2696 | 2827 | 2957 | 308 | 32 | 334 | 3479 | 610 | 3740 | 3871 | 45 |
| 46 | 8784 | 8774 | 8765 | 55 | 87 | 873 | 8725 | 8715 | 05 | 45.869 | 3.3423 | 35 | 36 | 38 | 3956 | 409 | 4223 | 57 | 4490 | 4624 | 46 |
| 47 | 875 | 8748 | 38 | 28 | 8718 | 8708 | 8697 | 8687 | 8677 | $46 \cdot 866$ | 414 | 4286 | 4422 | 4558 | 4695 | 4831 | 4967 | 5104 | 5240 | 53 | 47 |
| 48 | 8731 | 8721 | 8711 | 8701 | 8690 | 8680 | 8670 | 8659 | 8649 | $47 \cdot 8638$ | 3.4876 | 5015 | 5154 | 5294 | 5433 | 5572 | 5711 | 5851 | 5990 | 61 | 48 |
| 49 | 8705 | 8694 | 868 | 8674 | 8663 | 8653 | 8642 | 8631 | 8621 | 48.8610 | 3.5602 | 5745 | 5887 | 6029 | 6171 | 6313 | 6455 | 6597 | 674 | 68 | 49 |
| 50 | 8678 | 8668 | 8657 | 8647 | 8636 | 8625 | 8614 | 8603 | 593 | $49 \cdot 858$ | 3.6329 | 6474 | 6619 | 6764 | 6909 | 7054 | 7199 | 734 | 48 | 7634 | 50 |
| 51 | 865 | 8641 | 8630 | 8619 | 8609 | 859 | 8587 | 76 | 856 | 50.855 | 3.7056 | 7204 | 7351 | 749 | 76 | 7795 | 7943 | 8091 | 823 | 8387 | 5 |
| 5 | 8626 | 8615 | 8604 | 8592 | 8581 | 8570 | 855 | 8548 | 853 | 51.85 | $3 \cdot 7782$ | 7933 | 8084 | 8235 | 8386 | 8536 | 8687 | 8838 | 89 | 91 | 52 |
| 5 | 8599 | 8588 | 8577 | 8565 | 8554 | 8543 | 8531 | 8520 | 8508 | 52.849 | 3．8509 | 8662 | 8816 | 8970 | 9124 | 9278 | 9431 | 9585 | 973 | 9892 | 53 |
| 54 | 8573 | 8561 | 50 | 38 | 8527 | 8515 | 8503 | 8492 | 8480 | 53.8468 | 3.9235 | 9392 | 9549 | 970 | 9862 | ＋019 | 0175 | 033 | 0488 | 0645 | 54 |
| 55 | 8546 | 8535 | 8523 |  | 8490 | 8488 | 76 |  | 8452 | $54 \cdot 8440$ | 3.9962 | －121 | 0281 | 0441 | 0600 | 0760 | 0919 | 107 | 123 | 11398 | 55 |
| 56 | 8520 | 8508 | 496 | 8484 | 8472 | 8460 | 8448 | ｜ | 8424 | 55 | 688 | 851 | 13 | 1176 | 1338 | 1501 | 166 | 182 | 1988 |  | 56 |
| 57 | 8493 | 8481 | 69 | 8457 | 8445 | 8433 | 20 | 408 | 8396 | 56.83 | 4．1415 | 1580 | 1746 | 1911 | 2076 | 2242 | 2407 | 2573 | 2738 | 2903 | 57 |
| 58 | 8467 | 8455 | 8442 | 8430 | 8418 | 8405 | 8393 |  | 8367 | 57.835 | 4.2142 | 2310 | 2478 | 2646 | 281 | 2983 | 3151 | 3319 | 3488 | 365 | 58 |
| 59 | 844！ | 8428 | 8416 | 8403 | 8390 | 8378 | 8365 | 35 | 8339 | 58.832 | 4.2868 | 3039 | 3211 | 3382 | 3553 | 3724 | 389 | 406 | 423 | 4409 | 59 |
| 60 | 8414 | 1 | 8389 | 76 | 8363 | 8350 | 8337 | 24 | 8311 | 59．8298 | 3595 | 3769 | 3943 | 411 | 429 | 4465 | 639 | 481 | 4987 | 5161 | 60 |
|  | 8388 | 8375 | 8362 | 8349 | 8336 | 8323 | 309 | 296 | 8283 | $60 \cdot 827$ | 4.4321 | 4498 | 467 | 4852 | 5029 | 5206 | 5383 | 5560 | 5737 | 5914 | 61 |
| 62 | 8361 | 8348 | 8335 | 8322 | 8308 | 8295 | 82 | 8268 | 8255 | 61.824 | 4.5048 | 5228 | 5408 | 558 | 5767 | 5947 | 6127 | 6307 | 64 |  | 62 |
| 63 | 8335 | 8321 | 8308 | 8295 | 8281 | 8268 | 8254 | 240 | 8227 | $62 \cdot 821$ | 4.5775 | 5957 | 6140 | 6323 | 6506 | 6688 | 6871 | 705 | 7237 | 741 | 63 |
| 64 | 8308 | 8295 | 8281 | 8268 | 8254 | 8240 | 8226 | 8212 | 8198 | $63 \cdot 8185$ | $4 \cdot 6501$ | 6687 | 6872 | 705 | 7244 | 7429 | 7615 |  |  |  | 6 |
| 65 | 8282 | 8268 | 8254 | 8241 | 8227 | 8213 | 8199 | 8184 | 8170 | 64：8156 | 47228 | 7416 | 7605 | 7793 | 798 | 8171 | 8359 | 8548 | 8736 |  | 65 |
| 66 | 8256 | 42 | 8228 | 821 | ${ }^{8199}$ | 85 | 7 | 8157 | 8142 | 65.812 | 4.79 | 8146 | 8337 | 8529 | 8720 | 8912 | 9103 | 228 | 9486 |  | 66 |
|  | 822 | ， | 1 | －118 | 145 | 130 | 13 | 8129 | 8114 | 66．809 | 4.868 | 8875 | 9070 | 926 | 94 | 9653 | 9847 | 0788 | 0236 | 0430 | 68 |
| 68 | 8203 | 8188 | 8174 | 8159 | 8145 | 8130 | 8115 | 8101 | 8086 | $67 \cdot 807$ | 494 | 9605 | 9802 | 9999 | －197 | 0394 | 0591 | 0788 | 1735 | 1935 | 68 |
| 69 | 8176 | 8162 | 8147 | 8132 | 8117 | 103 |  | 8073 | 8058 | $68 \cdot 8043$ | 5.0134 | 0334 | 0534 | 0735 | 0935 | 1135 | 1335 | 1535 | 1735 | 1935 | 69 |
| 70 | 8150 | 8135 | 8120 | 8105 | 8090 | 8075 | 060 | 8045 | 8030 | 69.8014 | 5.086 | 106 | 12 | 1470 | 1673 | 876 | 2079 | 2282 | 2485 | 2688 | 70 |
| 71 | 8123 | 8108 | 8093 | ${ }^{8078}$ | 8063 | 8048 | 8032 | 8017 | 8001 | 70.798 | 5.1587 | 1793 | 1999 | 2205 | 2411 | 2617 | 2823 | 3772 | 3235 | 3419 |  |
| 72 | 8097 | 8082 | 8066 | 8051 | 8036 | 8020 | 8005 | 7989 | 7973 | 71.795 | 5.2314 | 2523 | 2732 | 2940 | 3149 | 3358 | 356 | 3776 | 3985 | 419 | 72 |
| 73 | 8071 | 8055 | 8040 | 8024 | 8008 | 7993 | 7977 | 7961 | 7945 | 72.7929 | 5.3040 | 3252 | 3464 | 3676 | 3887 | 4099 | 4311 | 4523 | 4734 | 494 | 73 |
| 74 | 8044 | 8028 | 8013 | 7997 | 7981 | 7965 | 794 | 7933 | 7917 | $73 \cdot 7901$ | $5 \cdot 3767$ | 3982 | 4196 | 4411 | 4626 | 4840 | 5055 | 523 | 5484 | 5695 | 74 |
| 75 | 8018 | 8002 | 7986 | 7970 | 54 | 7938 | 7921 | 7905 | 7889 | 74－7872 | 5.4494 | 4711 | 4929 | 5146 | 5364 | 5581 | 5799 | 601 | 6234 | 645 | 75 |
| 76 | 7991 | 7975 | 7959 | 7943 | 7926 | 7910 | 7894 | 7877 | 7861 | 75．784 | 5.522 | 5440 | 5661 | 5882 | 6102 | 6322 | 6543 | 6763 | 6984 | 720 | 76 |
| 77 | 7965 | 7948 | 7932 | 7916 | 7899 |  | 7866 | 7849 | 7833 | 76.7816 | $5 \cdot 5947$ | 6170 | 6393 | 6617 | 6840 | 7064 | 7287 | 7510 | 7734 | 7957 | 77 |
| 78 | 7938 | 7922 | 7905 | 7889 | 7872 | 7855 | 7838 | 7821 | 7804 | 77 ＇778 | 5.6673 | 6900 | 7126 | 7352 | 7578 | 7805 | 8031 | 8257 | 8483 | 871 | 78 |
|  | ， | 989 | 785 |  | 345 | 828 | 7811 | 7793 | 7776 | 78.7759 | 5.7400 | 7629 | 7858 | 8087 | 8317 | 8546 | 8775 | 9004 | 9233 | 946 | 79 |
| 80 | 7886 | 7869 | 7852 | 7834 | 7817 | 800 | 7783 | 7766 | 7748 | 79.7731 | 5.8126 | 8358 | 8591 | 8823 | 9055 | 9287 | 9519 | 9751 | 9983 | －215 | 80 |
| 81 | 7859 | 7842 | 7825 | 07 | 7790 | 7773 | 7755 | 7738 | 7720 | 80.7702 | 5．8853 | 9088 | 9323 | 9558 | 9793 | ＋028 | 026 | 0498 | 0733 | 仡 | 81 |
| 82 | 7833 | 7815 | 7798 | 7780 | 7763 | 7745 | 7727 | 7710 | 7692 | 81.7674 | 5.9580 | 9817 | －055 | 0293 | 0531 | 0769 | 1007 | 1245 | 1483 | 172 | 82 |
| 83 | 7806 | 7789 | 7771 | 7753 | 7736 | 7718 | 7700 | 7682 | 7664 | $82 \cdot 7646$ | 6.0306 | 0547 | 0788 | 1028 | 1269 | 1510 | 175 | 1992 | 2232 | 247 | 83 |
| 84 | 47780 | 7762 | 7744 | 7726 | 7708 | 7690 | 7672 | 7654 | 7635 | 83.7617 | 6.1033 | 1276 | 1520 | 1764 | 2007 | 2251 | 2495 | 2739 | 2982 | 228 | 84 |
| 85 | 57753 | 7735 | 7717 | 769 | 768 | 7663 | 7644 | 7626 | 7607 | $84 \cdot 7589$ | 6.1759 | 2006 | 2252 | 2499 | 2746 | 2992 | 323 | 348 | 373 | 397 | 85 |
| 86 | 67727 | 7709 | 7690 | 7672 | 654 | 7635 | 7617 | 7598 | 7579 | 85.7560 | 6.2486 | 2735 | 2985 | 3234 | 3484 | 3733 | 3983 | 4232 | 4482 | 473 | 86 |
| 87 | 7701 | 7682 | 7664 | 7645 | 7626 | 7608 | 7589 | 7570 | 7551 | 86.7532 | 6.3212 | 3465 | 3717 | 3970 | 4222 | 4474 | 4727 | 4979 | 5231 | 548 | 87 |
| 88 | 7674 | 7655 | 7637 | 7618 | 7599 | 7580 | 7561 | 7542 | 7523 | $87 \cdot 7504$ | $6 \cdot 3939$ | 4194 | 4450 | 4705 | 4960 | 5215 | 5471 | 5726 | 5981 | 623 | 88 |
| 89 | 97648 | 7629 | 7610 | 7591 | 7572 | 7553 | 7533 | 7514 | 7495 | 88.7475 | 6.4666 | 4924 | 5182 | 5440 | 5698 | 5957 | 6215 | 6473 | 673 | 698 | 89 |
| 90 | 07621 | 7602 | 7583 | 7564 | 7545 | 7525 | 7506 | 7486 | 7467 | 89.7447 | 6.5392 | 5653 | 5914 | 6175 | 643 | 669 | 6959 | 17220 | 7481 | 7742 | 90 |
| 91 | 7595 | 7575 | 7556 | 7537 | 7517 | 7498 | 478 | 458 | 退 | 90.7419 | 6.6119 | 6383 | 6647 | 6911 | 7175 | 7439 | 7703 | 7967 | 8231 | 845 | 倍 |
| 92 | 7568 | 7549 | 7529 | 7510 | 7490 | 747 | 7450 | 7430 | 7410 | 91.7390 | $6 \cdot 6845$ | 7112 | 7379 | 7646 | 7913 | 8180 | 8447 | 8714 | 8980 | 924 | 92 |
| 93 | 37542 | 7522 | 7502 | 7483 | 7463 | 7443 | 7423 | 7402 | 7382 | 92．7362 | $6 \cdot 7572$ | 7842 | 8112 | 8381 | 8651 | 8921 | 9191 | 9460 | 9730 | －000 | 93 |
| 94 | 7515 | 749 | 7476 | 456 | 435 | 7415 | 7395 | 7374 | 7354 | $93 \cdot 7334$ | 6.8299 | 8571 | 8844 | 9117 | 9389 | 9662 | 9935 | －207 | 0480 | （ | 94 |
| 95 | 7489 | 7469 | 7449 | 7428 | 408 | 7388 | 7367 | 7347 | 7326 | 94.7305 | 6.9025 | 9301 | 9576 | 9852 | 1127 | 0403 | 067 | 0954 | 123 | 150 | 95 |
| 96 | 7463 | 7442 | 7422 | 7401 | 7381 | 7360 | 7339 | 7319 | 7298 | 95.7277 | 6.9752 | ＋030 | 0309 | 0587 | 0866 | 114 | 1423 | 1701 | 1980 | 225 | 96 |
| 97 | 7436 | 7416 | 7395 | 7374 | 7354 | 7333 | 7312 | 7291 | 7270 | 96.7248 | $7 \cdot 0478$ | 0760 | 1041 | 1322 | 1604 | 1886 | 2167 | 2448 | 2729 | 301 | 97 |
| 98 | 7410 | 7389 | 7368 | 7347 | 7326 | 7305 | 7284 | 7263 | 7241 | 97•7220 | $7 \cdot 1205$ | 1489 | 1773 | 2058 | 2342 | 2626 | 291 | 3195 | 347 | 376 | 98 |
| 99 | 7383 | 7362 | 7341 | 7320 | 7299 | 7278 | 7256 | 7235 | 7213 | 98.7192 | 7•1931 | 2219 | 2506 | 2793 | 3080 | 3367 | 3655 | 3942 | 422 | 451 | 99 |
| 100 | 7357 | 7336 | 7315 | 7293 | 7272 | 7250 | 7229 | 207 | 785 | $99 \cdot 7163$ | 7.2658 | 2948 | 3238 | 3528 | 3818 | 4109 | 4399 | 4689 | 4979 | 5269 | 100 |
|  | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | $46^{\prime \prime}$ | $45^{\prime}$ | $44^{\prime}$ | $43^{\prime}$ | $42^{\prime}$ | $41^{\prime}$ | $50^{\prime}$ | 49 | $48^{\prime}$ | 47 | $46^{\prime}$ | $45^{\prime}$ | $44^{\prime}$ |  | $42^{\prime}$ | $141^{\prime}$ |  |
|  |  |  |  |  |  | NE． |  |  |  |  |  |  |  |  |  | OSINE． |  |  |  |  | $85^{\circ}$ |

TRAVERSE TABLES．

|  | Cosine． |  |  |  |  |  |  |  |  |  | Ine． |  |  |  |  |  |  |  |  |  | $4^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 21 | $22^{\prime}$ | ${ }^{23}$ | $24^{\prime}$ | 25 | $26^{\prime}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 997 | 997 | 997 | 9971 | 9971 | 9970 | 9970 | 9970 | 9970 | ．996 | 0756 | 1075 | 0761 | 0764 | 10767 | 0770 | 0773 | 0776 | 779 | 782 |  |
|  |  | 9942 | 994 | 9942 | 9941 | 9941 | 9940 | 9940 | 993 | 1.99 | 1511 | 1517 | 1523 | 1529 | 134 | 1540 |  |  |  |  |  |
|  | 9914 | 99 | 99 | 9912 | 99 | 99 |  |  | 990 | 2.990 | 2267 | 2275 |  |  | 2302 | 2310 |  |  |  |  |  |
|  | 9886 | 988 | 98 | 9883 | 98 |  |  |  | 987 | 3.987 |  |  |  |  |  |  |  |  |  |  |  |
|  | 98 | 98 | 98 | 9854 | 98 | 9852 |  |  | 9848 | 4．984 | 3778 | 3792 | 3807 | 382 | 3836 | 3850 | 3865 | 387 | 389 |  |  |
|  | 98 | 98 | 98 | 9825 | 9823 | 9822 | 9820 | 9819 | 9818 | 5.98 | 4534 | 455 | 4568 | 4586 |  | 1 |  |  |  |  |  |
|  | 9800 | 979 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9771 | 97 | 97 |  |  |  |  |  | 975 |  |  |  | 60 |  |  | 6161 | 4 | 62 | 623 |  |  |
|  |  |  |  |  |  | 9733 |  |  |  |  |  |  |  |  |  | 6931 | 6957 | 593 |  |  |  |
| 10 | 19714 | 9712 |  |  |  |  | 97 |  |  |  |  | 758 |  |  |  |  |  |  | 78 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9241 |  |  |  |  | 12 |
|  | 9628 |  |  |  |  |  |  |  |  |  |  |  | 98 | 9936 | 9973 | ＋011 | 49 | 008 |  |  | 13 |
| 14 | 960 | 95 | 9594 | 95 | 9587 | 9584 | 9581 | 9578 | 9575 | 13.95 | 1.05 | 0619 | 0659 | 0700 |  | 078 |  | 08 |  |  |  |
| 15 | 9571 | 95 |  | 9561 |  |  | 95 |  | 9544 | 14．954 | 11334 | 1377 | 142 | 146 | 150 | 155 | 159 | 163 | 16 | 17 | 15 |
| 16 | 9543 | 953 | 195 | 9532 | 95 | 9525 | 9521 | 18 | 951 | 15 | 1.2089 | 213 | 218 | 22 | 12275 | 232 | 2368 |  |  |  | 16 |
| 17 | 9514 |  |  | 9503 | 94 | 9495 | 9491 | 9488 | 9484 | 16.94 | 12 |  |  |  |  |  |  |  |  |  |  |
| 18 | 948 | 9481 | 94 | 9474 | 9470 | 9465 | 94 | 94 | 9453 | 17 |  | 365 |  | 375 |  |  | 3914 |  | 40 |  |  |
|  |  |  | 9448 |  |  |  | 943 | 9427 | 9423 |  |  |  |  |  |  |  |  | 474 |  |  |  |
| 20 | 9428 | 942 | 9419 | 9415 | 9411 | 9406 | 94 | 9397 | 9393 | 19.93 |  | 517 |  |  |  |  |  |  | 557 |  | 20 |
| 21 | 9400 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 6233 |  |  |  |  |
|  | 砛 | 93 |  |  | 93 |  | 9342 | 93 | 93 | 21 |  | 66 | 67 | 68 |  |  |  |  |  |  |  |
|  | 93 |  |  |  |  | 9317 |  |  | 9301 |  |  |  | 75 |  |  |  | 7779 |  |  |  |  |
| 2 |  |  |  |  |  |  |  | 92 | 9271 |  | 1.8 |  | 82 | 834 | 84 | 8482 | 8552 |  |  |  | 24 |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  | 9035 |  | 9180 | 9252 | 9325 | 9397 | 9470 |  | 25 |
|  | 9257 |  |  |  |  |  |  |  |  |  |  | 972 | 979 |  | 994 | ． 02 | 009 | 0173 | 024 |  | 26 |
|  |  |  |  |  |  |  |  |  |  |  |  | 047 |  |  |  |  |  |  |  |  |  |
| 28 | 9200 | 919 |  |  |  |  | 91 | 9156 | 9150 |  | $2 \cdot 1156$ | 1238 | 1319 |  |  | 1563 | 1644 | 172 |  |  |  |
|  |  | 9165 |  |  |  |  |  |  | 9119 |  | $2 \cdot 1912$ |  | 208 | 21 |  |  | 2417 | 250 |  |  |  |
| 30 | 9142 | 9136 | 9129 | 912 |  | 9109 | 9102 |  | 9089 |  | 26 | 275 | 2842 | 292 | 301 | 310 | 3190 | 327 | 336 |  | 30 |
| － | 911 | 107 | 9100 | 9093 |  |  |  |  | 9058 | 30 | $2 \cdot 3423$ |  |  |  |  |  |  |  |  |  |  |
| 33 |  | 907 | 907 |  | 9057 |  |  |  | 9028 |  |  | 427 | 436 |  |  |  | 473 | 482 |  |  |  |
| 33 |  | 90 | 90 |  |  |  |  |  |  |  |  |  |  |  |  |  | 55 | 56 |  |  | 33 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 35 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 897 | 8963 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 |  |  |  |  |  |  |  | 8854 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 39 |  |  |  |  |  |  |  |  |  |  | 2.9468 |  |  |  |  |  |  |  | 037 |  |  |
| 40 | 8857 | 8848 | 8839 | 8830 | 8821 | 8812 | 8803 | 87 | 85 | $39 \cdot 87$ | 022 | 334 | 045 | 057 | 068 | 08 | 092 |  | 115 |  | 40 |
| 41 | 88 | ${ }^{88}$ | ${ }^{8810}$ | 88 |  | 878 | ${ }^{8773}$ | 8764 | 87 | ${ }^{40 \cdot 87}$ | 3．099 |  |  |  |  |  |  |  |  |  |  |
| 42 |  |  | 87 | 87 |  |  |  |  | 87 | $41 \cdot 87$ | ， | 185 |  |  |  |  |  |  |  |  |  |
| 43 |  | 876 | 8752 | 87 | 8733 | 8723 | 8713 | 8704 | 8694 | 42.86 | 3.2 |  | 27 |  |  |  |  |  |  |  |  |
| 44 |  | 873 | 87 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 413 |  |  |  |
| 45 |  |  |  |  |  |  |  |  |  |  | $3 \cdot 400$ | 4132 |  |  |  |  | 4785 |  |  |  | 45 |
|  |  | 8675 | 8665 | 86 |  |  |  |  |  | $45^{\circ} 8$ |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 86 |  |  |  |  |  | 56 |  |  |  |  |  | 646 |  |  |  |
| 48 |  | － |  |  |  |  |  |  |  |  |  | 640 | 654 | 66 | 68 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\frac{50}{51}$ | 857 | 8560 | 8542 | 8538 | 8526 |  | 8504 | 8493 | 8481 | 49 | $3 \cdot 7$ | 792 | 8070 | 82 | 836 | 8505 | 8650 | 87 | 894 |  |  |
|  | 85 | 8531 | 85 | 85 |  | ${ }^{2}$ | 8474 |  |  |  |  | 868 |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  |  |  |  | 8444 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | ¢ | 8473 | 8462 | 8451 | 84 | ． | 8414 | 84 | 839 | 52：838 | 4 | 2 | S |  |  |  |  |  |  |  |  |
| 54 | 84 | 8444 | 8432 | 842 | 8409 | 8396 | 838 | 83 | 8360 | $53 \cdot 83$ | 4.08 | 095 | 115 | 127 | 142 | 15 |  |  |  |  |  |
| 55 | 84 | 841 |  | 839 | 83 | 8367 | 835 |  |  | 54：83 | $4 \cdot 15$ | 171 | 187 |  | 219 | 23 | 25 |  |  |  |  |
|  | 83 | 8387 | 83 | 83 | 8350 | 83 | 832 | 8312 | 8299 | 55.82 |  | 247 | 263 |  | 296 |  |  |  |  |  |  |
| 57 | 83 | 835 | 83 | 83 | 8320 | － | 829 |  | 82 | 56 |  |  | 3399 | 35 |  |  |  |  |  |  |  |
| 58 |  | 833 |  |  | 8291 | 8278 |  |  | 82 |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 |  | 8300 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | 8272 |  |  |  |  |  | 8191 |  |  |  | 5509 |  |  |  |  |  | 6553 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 |  | 81 | 81 | 8157 | 8143 | 8129 | 8115 | 810 |  |  |  |  | 7968 |  | 833 | 85 |  |  |  |  |  |
| 5 |  | 8156 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 65 |  | 812 |  |  |  |  |  |  |  | 64.80 | 4.911 | 9302 | 94 | 965 | 986 | ＋0．5 |  | 04 |  |  | 55 |
| －6 | 81 | 8099 | 8084 | 807 |  | 80 |  | 801 |  |  |  | d | 025 |  | 06 |  |  |  |  |  |  |
| 67 |  | 8070 |  |  |  |  |  |  |  |  |  | － | 1 | 120 |  |  |  |  |  |  |  |
| 68 |  | 80 | 80 | 80 |  |  | 796 |  | 79 | 67.79 | 513 | 157 | 1775 | 仡 | 21 |  |  |  |  |  | 68 |
| 69 |  |  |  |  |  | 79 | 793 |  |  |  |  | 233 | 25 | 27 | 293 |  |  |  |  |  | 析 |
| 70 |  |  | 7968 |  | 7937 | 792 | 790 | 789 | 787 |  | 5.28 |  | 32 | 350 |  | 39 | 410 | 43 | 4515 |  |  |
| 7 |  | 795 |  |  | 7 |  |  |  | 7 |  |  |  | 40 | 426 |  |  |  |  |  |  |  |
|  |  | 79 | 79 |  | 787 | 7862 | 784 |  |  |  |  |  | 482 | 502 | 52 |  |  |  |  |  |  |
| 73 | 79 | 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 78 |  |  |  |  |  |  |  |  | $5 \cdot 591$ | 6128 | 6343 | 6557 |  |  |  |  |  |  | ${ }^{4}$ |
| 75 |  |  |  |  |  | 7773 |  |  |  |  |  |  |  | 7322 | 753 |  |  |  |  |  | 75 |
|  |  | 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
| 77 | 7779 | 7782 | 7765 | 7748 | 7731 | 7713 | 769 |  |  |  |  |  |  | 885 |  |  |  |  |  |  | 77 |
| 78 |  | 7753 |  |  |  | 7684 | 766 | 76 | 763 |  |  |  | 9388 | 9615 | 984 | ＋0 |  |  |  |  | 78 |
| 79 <br> 80 <br> 8 | 713 | 7695 | 7678 |  | 7642 | 62 | 7606 | 7588 | 7570 | 79 | 5.9692 6.0447 | 067 | 09 | 1143 | ${ }_{137}^{068}$ | 160 | ${ }_{1}^{1083}$ | 12 |  |  | 79 <br> 80 |
| 81 | 7684 | 766 | 7649 | 7631 |  |  | 7576 | 75 | 7540 |  | ， | 43 |  |  | 2120 | 237 |  |  |  |  |  |
| 82 | 765 | 76 | 7620 | 7602 | 75 | 7565 | 754 | 7 | 750 | 81 | 6 | 2 | 24 | 2672 | 291 | 3147 | 338 |  |  |  |  |
|  |  | 76 | 7591 | 7572 | 7554 | 753 | 751 | 749 | 74 |  | 6.27 | 295 | 3195 | 3436 | 367 | 391 | 415 |  |  |  | 83 |
| 84 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 | 7570 | 75 | 7533 | 7514 | 495 | 7476 | 745 | 7438 |  |  | $6 \cdot 42$ | 44 | 47 | 496 |  |  |  |  |  |  |  |
| 86 | 754 | ${ }_{7} 7$ | 545 | 7485 | 7438 | 7446 | ${ }^{7427}$ |  | 7388 | 85 |  |  | 548 | 572 | 597 |  |  |  |  |  |  |
|  |  | 748 | 7475 |  | 7436 | 7416 | 7397 |  | 7358 | 86.73 | 6.57 |  | 624 | 649 | 67 |  |  |  |  |  | 87 |
| $\begin{aligned} & 88 \\ & 80 \end{aligned}$ |  | 74 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 90 | 7427 |  |  |  | 348 | 327 | 7307 | 7287 | ${ }_{726}$ | 88.727 89.72 |  | 826 | 85 | 878 |  |  | 56 |  |  |  |  |
|  | 739 | 7379 | 73 |  | 7318 |  |  | 72 |  |  |  |  |  |  |  |  |  |  | 08 |  |  |
|  | 737 | 7350 | 7329 |  |  |  | 7247 |  |  |  | 6.95 |  |  | 0315 |  | 084 |  |  |  |  |  |
| 93 | 734 | 732 | 7300 | 7280 | 7259 |  | 7217 | 7196 |  | 92.7 | 7.027 | 05 |  | 107 |  | 16 | 188 | 215 | 24 |  |  |
|  | 7313 | 72 |  |  | 7230 |  | 7188 | 716 | 714 | 93.712 | $7 \cdot 102$ | 129 | 157 | 184 | 211 |  | 266 |  |  |  |  |
|  | 728 | 72 | 7242 | 7221 | 7200 | 7179 | 7158 | 713 | 7115 | 947093 | $7 \cdot 178$ | 205 | 233 | 260 |  | 315 | 34 | 371 | 398 |  |  |
| 96 | 7256 | 7235 | 7213 | 7192 | 714 | 7119 | 728 | 7106 | 7084 |  | $7 \cdot 25$ | 2815 | 309 | 3372 | ${ }^{3650}$ | 3929 | 420 | 448 |  |  |  |
|  | 722 | 720 |  |  |  | 7119 | 709 |  | 7054 |  |  |  |  |  | 441 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7141 | 7119 | 7097 | 7075 | 7053 | 030 | 7008 | 6985 | 6963 | ， | 7359 | 584 | 6139 | 6429 | 6719 | 7009 | 29 | 7589 | 7879 | 816 | 99 100 |
|  |  | $39^{\prime}$ | $38^{\prime}$ | $37^{\prime}$ | $36^{\prime}$ | 35 | $3{ }^{\prime}$ | $33^{\prime}$ | $32^{\prime}$ | $31^{\prime}$ | $40^{\circ}$ |  |  | $37^{\prime}$ | 36 | 35 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $4{ }^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $4^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\prime}$ | 41 | $42^{\prime}$ | $43^{\prime}$ | $44^{\prime}$ | $45^{\prime}$ | 46 | $47^{\prime}$ | $48^{\prime}$ | $49^{\prime}$ | $40^{\prime}$ | 41 | $42^{\prime}$ | $43^{\prime}$ | 44 | $45^{\prime}$ | 46 | 47 | 48＇ |  |  |
|  | 9967 | 9967 | 9966 | 9966 | 9966 | 9366 | 9965 | 9965 | 9965 | ． 9965 | 0814 | 0816 | 0819 | 0822 | 25 | 28 | 0831 | 0834 | 0837 | 0840 |  |
|  | 9934 | 9933 | 9933 | 9932 | 9932 | 9931 | 9931 | 9930 | 9930 | 1.9929 | 1627 | 1633 | 1639 | 1645 | 1650 | 1656 | 1662 | 1668 | 1674 | 16 |  |
|  | 9901 | 9900 | 9899 | 9898 | 9898 | 9897 | 9896 | 9896 | 9895 | 2.9894 | 2441 | 2449 | 2458 | 2467 | 2476 | 2484 | 2493 | 2502 | 2510 | 2519 |  |
|  | 9867 | 9866 | 9865 | 9865 | 9864 | 9863 | 9862 | 9861 | 9860 | 3.9859 | 3254 | 3266 | 3278 | 3289 | 3301 | 3312 | 3324 | 3336 | 3347 | 3359 |  |
| 5 | 34 | 833 | 9832 | 831 | 9829 | 28 | 27 | 826 | 9825 | 4. | 4068 | 4082 | 4097 | 4111 | 4126 | 414 | 4155 | 416 | 4184 | 4198 |  |
| 6 | 9801 | 9800 | 979 | 9797 | 9795 | 9794 | 92 | 291 | 979 | 5.9788 | 4882 | 4899 | 4916 | 4934 | 4951 | 4968 | 4986 | 5003 | 50 | 5038 |  |
| 7 | 9768 | 9766 | 9765 | 9763 | 9761 | 9760 | 558 | 9756 | 9755 | 6.9753 | 5695 | 5715 | 5736 | 5756 | 5776 | 5797 | 5817 | 5837 | 5857 | 5878 |  |
|  | 9735 | 9733 | 9731 | 9729 | 9727 | 9725 | 9723 | 9721 | 9719 | 7.9717 | 6509 | 6532 | 6555 | 6578 | 6601 | 6625 | 6648 | 6671 | 6694 | 6717 |  |
|  | 9702 | 9700 | 9697 | 9695 | 9693 | 9691 | 9689 | 9687 | 9684 | 8.9682 | 7322 | 7348 | 7374 | 7401 | 7427 | 7453 | 7479 | 7505 | 7531 | 7557 |  |
| 10 | 9668 | 9666 | 9664 | 9661 | 9659 | 9657 | 9654 | 9652 | 9649 | 9.9647 | 8136 | 8165 | 8194 | 8223 | 8252 | 82 | 8310 | 8339 | 8368 | 8397 | 10 |
| 11 | 96 | 9633 | 9630 | 9627 | 9625 | 9622 | 9620 | 9617 | 9614 | 10.9612 | －8949 | 8981 | 9013 | 9045 | 9077 | 9109 | 4 | 3 | 9205 |  | 11 |
| 12 | 9602 | 9599 | 9596 | 9594 | 959 | 9588 | 9585 | 9582 | 9579 | 11.9576 | 9763 | 9798 | 9833 | 9867 | 9902 | 9937 | 9972 | －007 | 0041 | 007 | 12 |
| 13 | 9569 | 9566 | 9563 | 9560 | 9557 | 9554 | 9550 | 9547 | 9544 | 12.9541 | $1 \cdot 0577$ | 0614 | 0652 | 0690 | 0727 | 0765 | 0803 | 0840 | 0878 | 0916 | 13 |
| 14 | 9536 | 9533 | 9529 | 9526 | 9523 | 9519 | 9516 | 9512 | 9509 | 13.9506 | $1 \cdot 1390$ | 1431 | 1471 | 1512 | 1553 | 1593 | 1634 | 1674 | 1715 | 1755 | 14 |
| 15 | 9503 | 9499 | 9496 | 9492 | 9488 | 9485 | 481 | 9478 | 9474 | 14.9470 | $1 \cdot 2204$ | 2247 | 2291 | 2334 | 2378 | 2421 | 2465 | 250 | 2552 | 259 | 15 |
| 16 | 9470 | 9466 | 9462 | 9458 | 9454 | 9450 | 9447 | 9443 | 9439 | 15. | 1．3017 | 3064 | 3110 | 3157 | 3203 | 3249 | 3296 | 3342 | 3388 | 3435 | 16 |
| 17 | 9436 | 9432 | 9428 | 424 | 9420 | 9416 | 9412 | 9408 | 9404 | 16.9400 | ． 3831 | 3880 | 3930 | 3979 | 4028 | 4077 | 4127 | 4176 | 4225 | 42 | 16 |
| 18 | 9403 | 9399 | 9395 | 390 | 9386 | 832 | 377 | 9373 | 9369 | 17.936 | 4645 | 4697 | 4749 | 4801 | 4853 | 4905 | 4958 | 5010 | 5062 | 511 | 18 |
| 19 | 9370 | 9366 | 9361 | 9357 | 9352 | 9347 | 9343 | 9338 | 9334 | 18.9329 | 1.5458 | 5513 | 5568 | 5623 | 5678 | 5734 | 5789 | 5844 | 5899 | 5954 | 19 |
| 20 | 9337 | 9332 | 9327 | 9323 | 9318 | 9313 | 9308 | 9303 | 9299 | 19.9294 | 1.6272 | 6330 | 6388 | 6446 | 6504 | 6562 | 6620 | 6678 | 6736 | 679 | 20 |
| 21 | 9304 | 9299 | 9294 |  | 9284 | 9279 | 9274 | 9269 | 9264 | 20 | 7085 | 7146 | 7207 | 7268 | 7329 | 7390 | 10 | 1 | 7572 | 7633 | 21 |
| 22 | 9271 | 9265 | 9260 | 9255 | 9250 | 92 | 239 | 9234 | 9228 | $21 \cdot 9223$ | ． 789 | 7963 | 8026 | 809 | 8154 | 8218 | 8282 | 8345 | 840 | 8473 | 22 |
| 23 | 9238 | 9232 | 9227 | 9221 | 9216 | 9210 | 205 | 9199 | 9193 | 22.918 | －8713 | 8779 | 8846 | 8913 | 8979 | 9046 | 9113 | 9179 | 9246 | 9313 | 23 |
| 24 | 9204 | 9199 | 9193 | 9187 | 9181 | 9176 | 9170 | 9164 | 9158 | 23.9152 | ． 9526 | 9596 | 9665 | 9735 | 9804 | 9874 | 9944 | － 013 | 0083 | 015 | 24 |
| 25 | 9171 | 9165 | 9159 | 9153 | 9147 | 9141 | 9135 | 9129 | 9123 | 24.9117 | ． 034 | 0412 | 0485 | 0557 | 063 | 0702 | 0775 | 084 | 0919 | 099 | 25 |
| 26 | 9138 | 9132 | 26 | 9120 | 911 | 910 | 9101 | 9094 | 9088 | 25 ＇9 | $2 \cdot 1$ | 122 | 130 | 137 | 145 | 1530 | 160 | 168 | 1756 | 832 | 26 |
| 27 | 9105 | 9099 | 92 | 9086 | 9079 | 9073 | 66 | 9060 | 9053 | $26 \cdot 904$ | 2．19 | 2045 | 2123 | 2202 | 2280 | 2358 | 2436 | 2515 | 2593 | 267 | 27 |
| 28 | 9072 | 9065 | 9058 | 052 | 9045 | 9038 | 32 | 9025 | 9018 | $27 \cdot 901$ | 2.2780 | 2862 | 294 | 3024 | 3105 | 3186 | 3267 | 3349 | 3430 | 351 | 28 |
| 29 | 9039 | 9032 | 25 | 18 | 9011 | 9004 | 8997 | 8990 | 8983 | $28 \cdot 8976$ | 2.3594 | 3678 | 3762 | 384 | 3930 | 4014 | 409 | 4183 | 4267 | 43 | 29 |
| 30 | 9005 | 8998 | 91 | 84 | 8977 | 70 | 62 | 8955 | 48 | 9．894 | 2.4408 | 4495 | 4582 | 4669 | 4755 | 4842 | 492 | 5016 | 5103 | 5190 | 30 |
| 31 | 8972 | 896 | 8958 | 8950 | 8943 | 8935 | 8928 | 8920 | 8913 | 30．890 | ． | 531 | 5401 | 549 | 581 | 567 | 5760 | 5850 |  |  | 31 |
| 32 | 8939 | 8932 | 8924 | 8916 | 8909 | 8901 | 8893 | 8886 | 8878 | 31．887 | 2.603 | 6128 | 6220 | 6313 | 6406 | 649 | 659 | 6684 | 6777 | 6870 | 32 |
| 33 | 8906 | 8898 | 8890 | 8882 | 8875 | 88 | 8859 | 8851 | 884 | $32 \cdot 883$ | 2.684 | 6944 | 7040 | 713 | 723 | 7327 | 7422 | 7518 | 7614 | 770 | 33 |
| 34 | 8873 | 8865 | 8857 | 89 | 8840 | 8832 | 8824 | 8816 | 8808 | $33 \cdot 879$ | 7662 | 7761 | 7859 | 7958 | 8056 | 8155 | 82 | 8352 | 8450 | 854 | 34 |
| 35 | 884 | 8831 | 8823 | 15 | 8806 | 8798 | 8789 | 8781 | 8773 | 34．876 | 8476 | 8577 | 8678 | 8780 | 88 | 8983 | 908 | 9186 | 9287 | 938 | 35 |
| 36 | 8807 | 879 | 18789 | 8781 | 877 | 876 | 8755 | 746 | 873 | 35：878 | 2.9289 | 939 | 9498 | 96 | 97 | 9811 | 9915 | －0 | 0124 | 10228 | 36 |
| 37 | 8773 | 8765 | 8756 | 8747 | 8738 | 8729 | 8720 | 8711 | 8702 | 36．869 | 3.0 | 0210 | 031 | 042 | 05 | 0639 | 07 | 0854 | 0961 | 106 | 37 |
| 38 | 8740 | 8731 | 8722 | 8713 | 8704 | 8695 | 8686 | 8677 | 8667 | 37－865 | 3.091 | 1026 | 113 | 1247 | 1357 | 146 | 157 | 168 | 1798 | 190 | 38 |
| 39 | 8707 | 8698 | 8689 | 8679 | 8670 | 8661 | 8651 | 8642 | 8632 | $38 \cdot 8623$ | 3．1730 | 1843 | 1956 | 206 | 2182 | 2295 | 240 | 252 | 2634 | 274 | 39 |
| 40 | 8674 | 8664 | 55 | 8645 | 36 | 8626 | 17 | 07 | 97 | 39.858 | 3.2543 | 2659 | 2775 | 289 | 3007 | 3123 | 323 | 3355 | 347 | 358 | 40 |
| 41 | 864 | 863 | 8621 | 8612 | 602 | 859 | 582 | 57 | 8562 | 40．85 | 3.3357 | 3476 | 3595 | 37 | 3833 | 3951 | 4070 | 4189 |  |  | 41 |
| 42 | 8608 | 8598 | 8588 | 8578 | 8568 | 8558 | 8547 | 8537 | 8527 | 41.85 | 3.4171 | 4292 | 4414 | 453 | 4658 | 4779 | 4901 | 5023 | 5145 | 526 | 42 |
| 43 | 8575 | 8564 | 8554 | 8544 | 8533 | 8523 | 8513 | 8502 | 8492 | 42．848 | 3.4984 | 5109 | 5234 | 5358 | 5483 | 5608 | 573 | 5857 | 598 | 610 | 43 |
| 44 | 8541 | 8531 | 8520 | 10 | 8499 | 8489 | 78 | 8468 | 8457 | $43 \cdot 844$ | 57 | 5925 | 6053 | 6180 | 6308 | 6436 | 656 | 6691 | 681 | 6946 | 44 |
| 45 | 8508 | 8498 | 8487 | 76 | 8465 | 8454 | 444 | 8433 | 8422 | 44.841 | $3 \cdot 66$ | 6742 | 6872 | 7003 | 7133 | 7264 | 73 | 7525 | 7655 | 7785 | 45 |
| 46 | 8475 | 8464 | 8453 | 8442 | 8431 | 8420 | 09 | 8398 | 83 | 45.837 | $3 \cdot 7425$ | 75 | 769 | 78 | 7958 |  | 82 | 8358 | 8492 | 8625 | 46 |
| 47 | 8442 | 8431 | 8420 | 88 | 839 | 8386 | 374 | 8363 | 8352 | $46 \cdot 8340$ | 3.8239 | 8375 | 8511 | 86 | 8784 | 89 | 9056 | 9192 | 932 | 965 | 47 |
| 48 | 8409 | 8397 | 8386 | 8374 | 8363 | 8351 | 330 | 8328 | 8317 | 47－830 | 3．905 | 9191 | 933 | 9470 | 9609 | 9748 | 988 | －026 | 0165 | 03 | 48 |
| 49 | 8376 | 8364 | 8352 | 8341 | 8329 | 831 | 8305 | 8293 | 8282 | 48.8270 | 3.9 | ＋008 | 0150 | 0292 | 0434 | 057 | 0718 | 0860 | 1002 | 11 | 49 |
| 50 | 8342 | 8331 | 8319 | 8307 | 8295 | 8283 | 8271 | 59 | 46 | 49.823 | 4.0679 | 0824 | 969 | 1114 | 1259 | 1404 | 1549 | 1694 | 183 | 1984 | 50 |
| 51 | 830 | 829 | 8285 | 8273 | 8261 | 8248 | 8236 | 8224 | 8211 | 50.8 | 4.14 | 1641 | 1789 | 1936 | 34 | 2232 | 2380 | 52 |  |  |  |
| 52 | 8276 | 8264 | 8251 | 8239 | 8227 | 8214 | 82 | 818 | 8176 | 51．816 | 4.2307 | 2457 | 2608 | 2759 | 2910 | 30 | 32 | 3362 | 3512 | 366 | 52 |
| 53 | 8243 | 8230 | 8218 | 8205 | 8192 | 8180 | 8167 | 8154 | 8141 | $52 \cdot 812$ | 4.3120 | 3274 | 3427 | 3581 | 3735 | 3888 | 40 | 4196 | 4349 | 450 | 53 |
| 54 | 8210 | 8197 | 8184 | 8171 | 8158 | 8145 | 32 | 19 | 8106 | $53 \cdot 805$ | $4 \cdot 3934$ | 4090 | 4247 | 4403 | 4560 | 4716 | 4873 | 5030 | 518 | 531 | 54 |
| 55 | 8177 | 816 | 8151 | 8137 | P12 | 81 |  |  | 8071 | $54 \cdot 805$ | $4 \cdot 4747$ | 4907 | 5066 | 5226 | 5385 | 55 | 57 | 5863 | 6023 | 6182 | 55 |
| 56 | 8144 | 8130 | 8117 | 8104 | 80 |  | 8063 |  | 8036 |  | 4.5561 | 5723 | 58 | 6048 | 6210 | 6373 | 65 | 6697 | 6860 | 702 | 56 |
| 57 | 8110 | 8097 | 8083 | 8070 | 8056 | 8042 | 8029 | 8015 | 8001 | 56．798 | 4.6374 | 6540 | 6705 | 6870 | 7035 | 7201 | 73 | 7531 | 769 | 7862 | 57 |
| 58 | 807 | 8063 | 8050 | 8036 | 8022 | 8008 | 7994 | 7980 | 7966 | 57.795 | 4.7188 | 7356 | 7524 | 7692 | 7861 | 8029 | 8197 | 8365 | 8533 | 8701 | 58 |
| 59 | 8044 | 8030 | 8016 | 8002 | 7988 | 7974 | 7959 | 7945 | 7931 | 58.791 | 4.8002 | 8173 | 8344 | 8515 | 8686 | 8857 | 9028 | 9199 | 937 | 954 | 59 |
| 60 | 8011 | 7997 | 7982 | 68 | 7954 | 7939 | 7925 | 10 | 96 | 59.788 | 4.8815 | 89 | 9163 | 9337 | 9511 | 9685 | 985 | ．03 | 020 | 03 | 60 |
|  | 79 | 7963 | 7949 | 934 | 7920 | 7905 | 90 | 787 | 7861 | 60.784 | 4.9629 | 9806 | 998 |  | 0336 | 0513 | 0690 | 0867 | 104 |  | 61 |
| 62 | 7945 | 7930 | 7915 | 790 | 7885 | 787 |  | 784 | 7826 | 61781 | 5.0442 | 0622 | 0802 | 09 | 116 | 13 | 15 | 17 | 1880 | 206 | 62 |
| 63 | 7911 | 997 | 7882 | 7867 | 7851 | 7836 | 7821 | 7806 | 7791 | $62 \cdot 777$ | 5．125 | 1439 | 1621 | 1804 | 1987 | 2169 | 2352 | 2534 | 271 |  | 63 |
| 64 | 787 | 83 | 7848 | 7833 | 7817 | 802 | 7786 | 7771 | 7755 | 63.774 | 5.207 | 2255 | 2441 | 2626 | 2812 | 2997 | 3183 | 3368 | 3554 | 373 | 64 |
| 65 | 7845 | 7830 | 7814 | 798 | 7783 | 7768 | 7752 | 7736 | 7720 | 64.7705 | 5.2883 | 30 | 3260 | 3448 | 363 | 3825 | 401 | 4202 | 439 | 45 | 65 |
| 66 | 7812 |  | 7781 | 7765 | 7749 | 源 | 7717 | 7701 | 785 | 65.7670 | 5.3697 | 3888 | 4079 | 4271 | 4462 | 4653 | 4845 | 5036 | 522 | 5419 | 66 |
| 67 | 87 | 7763 | 784 |  |  |  | 7683 | 7667 | 7650 | $66 \cdot 7634$ | $5 \cdot 4510$ | 4705 | 4899 | 5093 | S28 | 5481 | 5676 | 5870 | 60 |  | 67 |
| 68 | 7746 | 7730 | 7713 | 7697 | 7681 | 7665 | 7648 | 7632 | 7615 | 67．7599 | 5.5324 | 5521 | 5718 | 5915 | 6112 | 6310 | 6507 | 6704 | 690 | 709 | 68 |
| 69 | 7713 | 7696 | 80 | 7663 | 7647 | 630 | 1814 | 7597 | 7580 | 68.756 | 5.6138 | 6338 | 6538 | 6738 | 6938 | 7138 | 7338 | 7538 | 773 | 7938 | 69 |
| 70 | 7679 | 7663 | 7646 | 629 | 7613 | 596 | 7579 | 7562 | 7545 | $69 \cdot 7528$ | 5.6951 | 7154 | 7357 | 7560 | 7763 | 7966 | 8169 | 8372 | 857 | 877 | 70 |
| 71 | 7646 | 7629 | 713 | 7596 | 79 | 562 | 7544 | 752 | 7510 | 70.749 | 776 | 7971 | 8176 | 8382 | 8588 | 8794 | 9000 | 920 | 9411 |  | 71 |
| 72 | 7613 | 7596 | 7579 | 7562 | 544 | 7527 | 7510 | 7492 | 7475 | 71745 | 5.8578 | 8787 | 8996 | 9204 | 9413 | 9622 | 9831 | －039 | 0248 | 045 | 72 |
| 73 | 7580 | 7563 | 7545 | 7528 | 510 | 7493 | 7475 | 7458 | 440 | 72.742 | 5.9392 | 9603 | 9815 | ． 027 | 0238 | 0450 | 0662 | 0873 | 1085 | 129 | 73 |
| 74 | 7547 | 7529 | 7512 | 7494 | 7476 | 7458 | 7441 | 7423 | 7405 | 73.738 | 6.0205 | 0420 | 0634 | 0849 | 1064 | 1278 | 1493 | 1707 | 1922 | 213 | 74 |
| 75 | 7514 | 析 | 7478 | 7460 | 7442 | 424 | 7406 | 7388 | \％ | 74．735 | 6.1019 | 1236 | 1454 | 1671 | 188 | 2106 | 232 | 254 | 275 | 297 | 75 |
| 76 | 7481 | 7463 | 7444 | 7426 | 7408 | 7390 | 7371 | 7353 | 7335 | 75.7316 | $6 \cdot 1833$ | 2053 | 2273 | 2494 | 2714 | 2934 | 3155 | 3375 | 3595 | 3815 | 76 |
| 78 | 析 | 析 | 7411 |  |  | 7355 | 7337 | 318 |  | $76 \cdot 728$ | 6.2646 | 286 | 3093 | 3316 | 3359 | 3762 | 3986 | 420 | 443 | 46 | 77 |
| 78 | 7414 | 7396 | 7377 | 7359 | 7340 | 7321 | 7302 | 7283 | 7264 | 77.7245 | 6.3460 | 3686 | 3912 | 4138 | 4364 | 4590 | 4817 | 5043 | 5269 | 5495 | 78 |
| 79 | 7381 | 析 | 44 | 325 | 析 | 7287 | 7268 | 249 | 7229 | 78.7210 | 64273 | 4502 | 4731 | 4960 | 5189 | 5418 | 5647 | 5877 | 610 | 633 | 79 |
| 80 | 7348 | 7329 | 7310 | 7291 | 7272 | 7252 | 7233 | 7214 | 7194 | $79 \cdot 7175$ | $6 \cdot 5087$ | 5319 | 5551 | 5783 | 6015 | 6247 | 6478 | 6710 | 694 | 717 | 80 |
| 81 | 7315 | 7296 | 7276 | 7257 | 7237 | 7218 | 7199 | 7179 | 7159 | 80.7139 | 6.5901 | 6135 | 6370 | 6605 | 6840 | 7075 | 7309 | 7544 | 777 | 8014 | 81 |
| 82 | 7282 | 7262 | 7243 | 7223 | 7203 | 7184 | 7164 | 7144 | 7124 | 81.7104 | 6.6714 | 6952 | 7190 | 7427 | 7665 | 7903 | 8140 | 8378 | 8616 | 885 | 82 |
| 83 | 7248 | 722 | 723 | 7189 | 7169 | 715 | 729 | 寿 | 7 728 | $82 \cdot 7069$ | 6.7528 | 7768 | 8009 | 8250 | 8490 | 8731 | 8971 | 9212 | 硡 | 矿 | 83 |
| 84 | 7215 | 7195 | 7175 | 7155 | 7135 | 711 | 7095 | 7074 | 705 | $83 \cdot 7034$ | 6.8341 | 8585 | 8828 | 9072 | 931 | 9559 | 9802 | －046 | 0289 | 0533 | 84 |
| 85 | 7182 | 7162 | 7142 | 7121 | 181 | 708 | 7060 | 7040 | 7019 | 84．6998 | 6．915 | 9401 | 9648 | 9894 | －14 | 0387 | 0633 | 088 | 1126 | 1373 | 85 |
| 86 | 7149 | 7129 | 7108 | 7088 | 7067 | 7046 | 226 | 005 | 硡4 | 85.696 | 6.996 | ＋218 | 04 | 0716 | 0966 | 1215 | 1464 | 1714 | 126 | 221 | 86 |
| 87 | 7116 | 705 | 7075 | 7054 | 7033 | 7012 | 6991 | 6970 | 6949 | 86.692 | $7 \cdot 0782$ | 1034 | 1286 | 1539 | 1791 | 2043 | 2295 | 2548 | 280 | 305 | 8 |
| 88 | 7083 | 7062 | 7041 | 7020 | 6999 | 6978 | 6956 | 6935 | 6914 | 87．6892 | 7－1596 | 1851 | 2106 | 2361 | 2616 | 2871 | 3126 | 3381 | 3636 | 389 | 88 |
| 89 | 7050 | 7028 | 7007 | 986 | 6965 | 6943 | 6922 | 6900 | 8814 | 88.6857 | 7.2409 | 2667 | 2925 | 3183 | 344 | 3699 | 3957 | 4215 | 4473 | 4731 | 89 |
| 90 | 7016 | 6995 | 6974 | 6952 | 6931 | 6909 | 6887 | 6865 | 6844 | 89：5822 | 7.3223 | 3484 | 3745 | 4006 | 4266 | 4527 | 4788 | 5049 | 5310 | 557 | 90 |
| 91 | 6983 | 6962 | 40 | 6918 | 6896 | 6875 | 853 | 6831 | 6809 | 90．6786 | 7.4036 | 4300 | 4564 | 4828 | 5092 | 5355 | 5619 | 5883 | 6147 | 64 | 91 |
| 92 | 6950 | 6928 | 6906 | 6884 | 6862 | 6840 | 6818 | 6796 | 6773 | 91．675 | $7 \cdot 4850$ | 5117 | 5383 | 5650 | 5917 | 6184 | 6450 | 6717 | 698 | 72 | 92 |
| 9 | 6917 | 6895 | 6873 | 6851 | 6828 | 6806 | 6784 | 6761 | 6738 | 92.6716 | 7.5664 | 5933 | 6203 | 6472 | 6742 | 7012 | 7281 | 7551 | 7820 | 809 | 93 |
| 94 | 6884 | 6862 | 6839 | 6817 | 6794 | 6772 | 6749 | 6726 | 6703 | 93.6680 | 7.6477 | 6750 | 7022 | 729 | 7567 | 7840 | 8112 | 8385 | 8657 | 893 | 94 |
| 95 | 6851 | 6828 | 6806 | 6783 | 6760 | 6737 | 6714 | 6691 | 6668 | 94．664 | 729 | 7566 | 7842 | 117 | 8392 | 8668 | 8943 | 22 | 9494 | 97 | 95 |
|  | 6818 | 679 | 6772 | 6749 | 6726 | 6703 | 6680 | 6657 | 6633 | $95 \cdot 6610$ | $7 \cdot 8104$ | 8383 | 8661 | 8939 | 9218 | 9496 | 974 | －052 | 33 | 66 | 9 |
| 97 | 678 | 676 | 6738 | 6715 | 6692 | 6669 | 6645 | 6622 | 6598 | $96 \cdot 6574$ | 7.8918 | 9199 | 9480 | 9762 | 1043 | 0324 | 0605 | 0886 | 116 | 144 | 97 |
| 98 | 6751 | 6728 | 6705 | 6681 | 6658 | 6634 | 6611 | 6587 | 6563 | 97－6539 | 7.9732 | －016 | 0300 | 0584 | 0868 | 1152 | 1436 | 1720 | 2004 | 228 | 98 |
|  | 78 | 6695 | 667 | 684 | 6624 | 660 | 6576 | 6552 | 6528 | 98.6504 | 8.0545 | 0832 | 1119 | 1406 | 1693 | 1980 | 2267 | 2554 | 2841 | 3128 | 99 |
| 100 | 6685 | 6661 | 6637 | 6614 | 6590 | 6566 | 6541 | 6517 | 6493 | $99 \cdot 6469$ | 81359 | 1649 | 1939 | 2228 | 2518 | 2808 | 3098 | 3388 | 3678 | 3968 | 100 |
|  | $20^{\prime}$ | ］ $9^{\prime}$ | $18^{\prime}$ | 17 | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ | $13^{\prime}$ | $12^{\prime}$ | $1^{\prime}$ | $0^{\prime}$ | 19 | 18 | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | 14 | $13^{\prime}$ | $12^{\prime}$ | 11 |  |
|  |  |  |  |  |  | E． |  |  |  |  |  |  |  |  | Cos | NE． |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $5^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $5^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | $1^{\prime}$ | $2^{\prime}$ | $3^{\prime}$ | $4^{\prime}$ | $5^{\prime}$ | $6^{\prime}$ | 7 | $8{ }^{\prime}$ | $9^{\prime}$ | $0^{\prime}$ | $1^{\prime}$ | 2 | 3＇ | $4^{\prime} 1$ | I | $6^{\prime}$ | 7 |  |  |  |
|  | 9962 | 9962 | 9961 | 996 | 9961 | 9961 | 9960 | 9960 | 9960 | －9960 | 0872 | 08 | 08 | 0880 | 0883 | 0886 | 0889 | 0892 | 0895 | 0898 | 1 |
| 2 | 9924 | 9923 | 9923 | 9922 | 9922 | 9921 | 9921 | 9920 | 992 | 1.9919 | 1743 | 1749 | 1755 | 176 | 1766 | 1772 | 1778 | 1784 | 178 | 1795 |  |
|  | 9886 | 9885 | 9884 | 9884 | 9883 | 9882 | 9881 | 9880 | 9880 | 2.9879 | 2615 | 2623 | 2632 | 2641 | 2649 | 2658 | 2667 | 2676 | 2684 | 2693 | 3 |
|  | 9848 | 9847 | 9846 | 9845 | 9844 | 9843 | 9842 | 9841 | 9840 | 3.9839 | 348 | 3498 | 3509 | 3521 | 3533 | 3544 | 3556 | 3567 | 3579 | 3591 |  |
| 5 | 9810 | 9808 | 9807 | 806 | 9805 | 9803 | 9802 | 9801 | 9799 | 4.9798 | 4358 | 4372 | 4387 | 440 | 4416 | 4430 | 4445 | 4459 | 4474 | 4488 | 5 |
| 6 | 9772 | 9770 | 9769 | 976 | 9766 | 9764 | 9762 | 9761 | 9759 | 5.9758 | 522 | 5247 | 52 | 5282 | 52 | 5316 | 5334 | 5351 | 5368 | 析 | 6 |
|  | 9734 | 9732 | 9730 | 9728 | 9726 | 9725 | 9723 | 9721 | 9719 | 6.9717 | 6101 | 6121 | 6141 | 6162 | 6182 | 6202 | 6223 | 6243 | 6263 | 6283 |  |
|  | 9696 | 9694 | 9692 | 9689 | 9687 | 9685 | 9683 | 9681 | 9679 | 7.9677 | 6972 | 6996 | 7019 | 7042 | 7065 | 7088 | 7112 | 7135 | 715 | 7181 |  |
|  | 9658 | 9655 | 9653 | 9651 | 9648 | 9646 | 9644 | 9641 | 9639 | 8.9637 | 844 | 7870 | 7896 | 7922 | 7948 | 7974 | 8000 | 8027 | 805 | 8079 |  |
| 10 | 9619 | 9617 | 9614 | 9612 | 9609 | 9607 | 9604 | 9602 | 9599 | 9.9596 | 8716 | 8745 | 8774 | 8803 | 8831 | 8860 | 8889 | 8918 | 8947 | 8976 | 10 |
| 11 | 9581 | 9579 | 957 | 957 | 9570 | 9567 | 95 | 95 | 95 | 10.95 | 958 | 9619 | 96 | 968 | 971 | 9747 | 97 | 10 | 9842 | 9874 | 1 |
| 12 | 9543 | 9540 | 9537 | 9534 | 9531 | 9528 | 9525 | 9522 | 9519 | 11.9516 | 1.0459 | 0493 | 0528 | 0563 | 0598 | 0633 | 0667 | 0702 | 073 | 0772 | 12 |
| 13 | 9505 | 9501 | 9499 | 9495 | 9492 | 9489 | 9485 | 9482 | 9479 | 12.9475 | 1.1330 | 1368 | 1406 | 1443 | 1481 | 1519 | 1556 | 1594 | 1632 | 1669 | 13 |
| 14 | 9467 | 9464 | 9460 | 9457 | 9453 | 9449 | 9446 | 9442 | 9438 | 13.9435 | $1 \cdot 220$ | 2242 | 2283 | 2324 | 2364 | 2405 | 2445 | 2486 | 252 | 2567 | 14 |
| 15 | 9429 | 9425 | 9422 | 9418 | 14 | 9410 | 9406 | 9402 | 9398 | 14.9394 | $1 \cdot 3073$ | 3117 | 3160 | 3204 | 3247 | 3291 | 3334 | 3378 | 342 | 346 | 15 |
| 16 | 9391 | 9387 | 9383 | 9379 | 9375 | 9371 | 936 | 9362 | 9358 | 15.9354 | $1 \cdot 3$ | 399 | 4038 | 4084 | 413 | 417 | 4223 | 4269 | 431 | 4362 | 16 |
| 17 | 9353 | 9349 | 9344 | 9340 | 9336 | 9331 | 9327 | 9323 | 9318 | 16.9314 | $1 \cdot 4816$ | 4866 | 4915 | 4964 | 5014 | 5063 | 5112 | 5161 | 521 | 526 | 17 |
| 18 | 9315 | 9310 | 93 | 9301 | 9297 | 9292 | 928 | 928 | 9278 | 17.9273 | 1.5688 | 5740 | 5792 | 5845 | 5897 | 5949 | 6001 | 6053 | 61 | 615 | 18 |
| 19 | 9277 | 9272 | 926 | 9262 | 9258 | 9253 | 9248 | 9243 | 9238 | 18.9233 | 1.6560 | 6615 | 6670 | 6725 | 6780 | 6835 | 6890 | 6945 | 7000 | 705 | 19 |
| 20 | 923 | 9234 | 9229 | 92 | 19 | 9213 | 9208 | 203 | 9198 | 19.9193 | $1 \cdot 7431$ | 7489 | 7547 | 7605 | 7663 | 7721 | 7779 | 7837 | 789 | 7953 | 20 |
| 21 | 9201 | 9196 | 9190 | 918 | 9179 | 9174 | 9169 | 916 | 9158 | 20.9152 | 1.8303 | 8364 | 8424 | 848 | 8546 | 8607 | 8668 | 8729 |  |  | 21 |
| 22 | 9163 | 9157 | 9152 | 9146 | 9140 | 9135 | 912 | 9123 | 9118 | 21.9112 | 1.9174 | 9238 | 9302 | 93 | 9429 | 9493 | 9557 | 9620 | 96 | 9748 | 22 |
| 23 | 9125 | 9119 | 9113 | 9107 | 9101 | 9095 | 9089 | 9083 | 9078 | 22.9072 | 2.0046 | 0112 | 0179 | 0246 | 0312 | 0379 | 0446 | 0512 | 057 | 0646 | 23 |
| 24 | 9087 | 9081 | 9075 | 9068 | 9062 | 9056 | 9050 | 9044 | 9037 | $23 \cdot 9031$ | 2.0917 | 0987 | 1056 | 1126 | 1196 | 1265 | 1335 | 1404 | 147 | 154 | 24 |
| 25 | 9049 | 9042 | 9036 | 9030 | 9023 | 9017 | 9010 | 9004 | 8997 | 24．8991 | $2 \cdot 1789$ | 1861 | 1934 | 2006 | 2079 | 2151 | 2224 | 2296 | 236 | 2441 | 25 |
| 26 | 901 | 9004 | 899 | 899 | 8984 | 8977 | 897 | 8964 | 8957 | 25•8950 | ． 2660 | 273 | 2811 | 288 | 296 | 3037 | 311 | 3188 | 32 | 3339 | 26 |
| 27 | 8973 | 8966 | 8959 | 8952 | 8945 | 8938 | 8931 | 8924 | 8917 | 26.8910 | 2.3532 | 3610 | 3689 | 3767 | 3845 | 3923 | 4001 | 4080 | 415 | 423 | 27 |
| 28 | 8935 | 8927 | 8920 | 891 | 8906 | 8899 | 8892 | 8884 | 8877 | $27 \cdot 8870$ | 2.4404 | 448 | 4566 | 4647 | 4728 | 4809 | 4890 | 4972 | 50 | 513 | 28 |
| 29 | 88 | 8889 | 88 | 8874 | 8867 | 8859 | 8852 | 8844 | 8837 | 28.882 | 2.5275 | 535 | 5443 | 5527 | 5611 | 5695 | 5779 | 5863 | 59 | 6031 | 29 |
| 30 | 8858 | 8851 | 884 | 8835 | 8828 | 8820 | 8812 | 8805 | 8797 | 29.8789 | $2 \cdot 6147$ | 6234 | 6321 | 6408 | 6494 | 6581 | 6668 | 6755 | 684 | 692 | 30 |
| 31 | 8820 | 8812 | 8805 | 8797 | 8789 | 8781 | 8773 | 8765 | 8757 | $30 \cdot 8749$ | 7018 | 7108 | 7198 | 7288 | 737 | 746 | 755 | 647 | 7737 |  | 31 |
| 32 | 8782 | 8774 | 8766 | 8758 | 8750 | 8741 | 8733 | 8725 | 8717 | 31.8708 | 2.789 | 7983 | 807 | 8168 | 8261 | 8353 | 8446 | 8539 | 8632 | 872 | 32 |
| 33 | 8744 | 8736 | 8727 | 8719 | 8711 | 8702 | 8694 | 8685 | 8676 | 32.8668 | 2.8761 | 8857 | 8953 | 9048 | 9144 | 9240 | 9335 | 9431 | 9526 | 962 | 33 |
| 34 | 8706 | 8698 | 8689 | 8680 | 8671 | 8663 | 8654 | 8645 | 8636 | $33 \cdot 8627$ | 2.9633 | 9731 | 9830 | 9929 | －027 | 0126 | 0224 | 0323 | 04 | 0520 | 34 |
| 35 | 8668 | 8659 | 8650 | 8641 | 8632 | 8623 | 8614 | 8605 | 8596 | 34•8587 | 3.0504 | 0606 | 0707 | 0809 | 0910 | 1012 | 1113 | 1214 | 131 | 141 | 35 |
| 36 | 86 | 86 | 8612 | 86 | 8593 | 8584 | 8575 | 8565 | 8556 | 35 | 3.13 | 14 | 15 | 16 | 179 | 18 | 20 | 2106 | 22 | 23 | 36 |
| 37 | 8592 | 8583 | 8573 | 8564 | 8554 | 8545 | 8535 | 8526 | 8516 | 36.850 | 3.2248 | 2355 | 2462 | 256 | 267 | 2784 | 28 | 2998 | 310 | 32 | 37 |
| 38 | 8554 | 8544 | 8535 | 8525 | 8515 | 8505 | 8496 | 8486 | 8476 | 37.8466 | 3.3119 | 3229 | 3339 | 3450 | 3560 | 3670 | 3780 | 3890 | 400 | 411 | 38 |
| 39 | 8516 | 8506 | 84 | 8486 | 8476 | 8466 | 8456 | 8446 | 8436 | 38.8426 | 3.3991 | 4104 | 4217 | 4330 | 444 | 4556 | 4669 | 4782 | 48 | 500 | 39 |
| 40 | 8478 | 8468 | 8458 | 8447 | 37 | 8427 | 8416 | 06 | 8396 | 39•8385 | 862 | 978 | 094 | 210 | 5326 | 442 | 5558 | 567 | 579 | 590 | 40 |
| 41 | 8440 | 8429 | 8419 | 8409 | 8398 | 8387 | 8377 | 8366 | 8356 | $40 \cdot 834$ | 3.5734 | 585 | 597 | 6090 | 6209 | 6328 | 6447 | 6565 | 6684 |  | 41 |
| 42 | 8402 | 8391 | 8380 | 837 | 8359 | 8348 | 8337 | 832 | 8315 | 41.8305 | 3.66 | 672 | 684 | 6971 | 70 | 7214 | 7336 | 7457 | 7579 |  | 42 |
| 43 | 8364 | 8353 | 8342 | 8331 | 8320 | 8309 | 8298 | 8287 | 8275 | 42.8264 | 3.7477 | 7602 | 7726 | 7851 | 797 | 8100 | 8225 | 8349 | 847 | 85 | 43 |
| 44 | 8326 | 8314 | 8303 | 829 | 8281 | 8269 | 825 | 8247 | 8235 | 43．8224 | 3.8349 | 8476 | 8604 | 8731 | 8859 | 8986 | 9113 | 9241 | 936 | 949 | 44 |
| 45 | 8288 | 8276 | 8265 | 8253 | 8242 | 230 | 8218 | 8207 | 8195 | 44：8183 | 3.9220 | 9350 | 9481 | 9611 | 9742 | 9872 | ＋002 | 0133 | 026 | 039 | 45 |
| 46 | 82 | 82 | 8226 | 82 | 8203 | 8191 | 8179 | 8167 | 8155 | 45 | 4．0092 | 0225 | 0358 | 049 | 0625 | 0758 | 891 | 1025 | 1158 | 1291 | 46 |
| 47 | 8212 | 8200 | 88 | 8176 | 8164 | 8151 | 8139 | 8127 | 8115 | $46 \cdot 8103$ | 4.0963 | 109 | 1236 | 1372 | 1508 | 1644 | 1780 | 1916 | 205 | 218 | 47 |
| 48 | 8173 | 8161 | 8149 | 8137 | 8124 | 8112 | 8100 | 8087 | 8075 | 47•8062 | $4 \cdot 1835$ | 1974 | 2113 | 2252 | 2391 | 2530 | 2669 | 2808 | 294 | 308 | 48 |
| 49 | 8135 | 8123 | 8110 | 8098 | 8085 | 8073 | 8060 | 8047 | 8035 | 48 ＇8022 | 4.2706 | 2848 | 2990 | 3132 | 3274 | 3416 | 3558 | 3700 | 3842 | 398 | 49 |
| 50 | 8097 | 8085 | 72 | 8059 | 8046 | 8033 | 8021 | 80 | 995 | 49.7982 | 4．3578 | 3723 | 3868 | 4013 | 4157 | 4302 | 4447 | 4592 | 473 | 4882 | 50 |
| 51 | 8059 | 8046 | 8033 | 8020 | 8007 | 7994 | 7981 | 7968 | 7954 | 50.794 | $4{ }^{4}$ | 459 | 4745 | 4893 | 504 | 5188 | 析 | 4 | 5632 |  | 51 |
| 52 | 802 | 80 | 79 |  |  | 7955 |  | 79 | 7914 | 51.79 | 4532 | 5472 | 5622 | 5773 | 5924 | 6074 | 6225 | 6376 | 65 | 667 | 52 |
| 53 | 7983 | 7970 | 7956 | 79 | 7929 | 7915 | 7902 | 7888 | 7874 | 52.786 | $4 \cdot 6193$ | 6346 | 6500 | 6653 | 6807 | 6960 | 7114 | 7268 | 742 | 757 | 53 |
| 54 | 794 | 793 | 7918 | 79 | 7890 | 7876 | 7862 | 7848 | 7834 | 53.7820 | 4•7064 | 7221 | 7377 | 7534 | 7690 | 7846 | 8003 | 815 | 831 | 847 | 54 |
| 55 | 7907 | 7893 | 7879 | 7865 | 7851 | 7837 | 7823 | 7808 | 7794 | 54．7780 | 4•7936 | 8095 | 8254 | 5314 | 857 | 8733 | 8892 |  | 921 | 937 | 55 |
| 56 | 786 | 7855 | 7841 | 78 | 7812 | 7797 | 77 | 7769 | 7754 | 55 | 4.8807 | 896 | 91 | 9294 | 9456 | 9619 | 9781 | 9943 | －10 | 026 | 56 |
| 5 | 7831 | 7817 | 7802 | 7787 | 7773 | 7758 | 743 | 7729 | 714 | 56.7699 | 4.9679 | 9844 | －009 | 0174 | 0339 | 0505 | 0670 | 0835 | 100 |  | 57 |
| 58 | 7793 | 7778 | 7763 | 77 | 773 | 7719 | 77 | 76 | 7674 | 57.765 | 5.0550 | 0718 | 0886 | 1055 | 1223 | 1391 | 1559 | 1727 | 189 | 206 | 58 |
| 59 | 7755 | 7740 | 7725 | 7710 | 76 | 7679 | 7664 | 7649 | 7634 | 58.7618 | 5．1422 | 1593 | 1764 | 1935 | 2106 | 2277 | 2448 | 2619 | 2790 | 296 | 59 |
| 60 | 7717 | 7702 | 7686 | 7671 | 7656 | 640 | 7625 | 76 | 7594 | 59．7578 | 5.229 | 246 | 264 | 281 | 210 | 316 | 3337 | 2610 | 270 | 2 | 50 |
| 61 | 7679 | 7663 | 7648 | 7632 | 7616 | 7601 | 885 | 7569 | 7553 | 60.753 | 5.316 | 3342 | 3519 | 3695 | 3872 | 4049 | 4226 | 4402 | 457 | 475 | 61 |
| 62 | 764 | 7625 | 7609 | 7593 | 7577 | 7561 | 7545 | 7529 | 7513 | 617497 | $5 \times 403$ | 4216 | 439 | 4576 | 475 | 4935 | 5114 | 5294 | 547 | 5653 | 62 |
| 63 | 7603 | 75 | 571 | 7555 | 7538 | 22 | 7506 | 7490 | 7473 | 62.7457 | －4908 | 5091 | 5273 | 5456 | 5638 | 5821 | 6003 | 6186 | 636 |  | 63 |
| 64 | 7565 | 7548 | 532 | 751 | 74 | 7483 | 7466 | 745 | 7433 | 63.7416 | 5.5780 | 5965 | 6151 | 6336 | 6521 | 6707 | 6892 | 7078 | 726 | 744 | 54 |
| 65 | 7527 | 7510 |  |  | 7460 | 7443 | 7427 |  | 7393 | 64．7376 | 5.6651 | 5840 | 7028 | 7216 | 7405 | 7593 | 7781 | 797 | 815 | 834 | 65 |
| 66 | 7489 | 7472 | 555 | 743 | 7421 | 404 | 7387 | 7370 | 7353 | 65.733 | $5 \cdot 7523$ | 7714 | 79 | 8097 | 8288 | 847 | 8670 | 8861 |  | 9244 | 66 |
| 67 | 7450 | 7433 | 7416 | 7399 | 7382 | 365 | 7348 | 7330 | 7313 | 66.729 | 5.839 | 8588 | 8783 | － | 9171 | 9365 | 9559 | 9753 |  |  | 67 |
| 68 | 741 | 73 | 7378 | 7360 | 73 | 7325 | 7308 | 72 | 7273 | $67 \cdot 7255$ | 5.9266 | 9463 | 9660 | 9857 | －054 | 0251 | 0448 | 0645 | 084 | 103 | 68 |
| 69 | 7376 | 析 | ， | 220 | 7304 | ， | 析 | 725 | 7233 | 68.7215 | 6137 | 0337 | 0537 | 0737 | 0937 | 1137 | 1337 | 1537 | 173 | 1937 | 69 |
| 70 | 7336 | 7319 | 301 | 7283 | 7265 | 247 | 229 | 7211 | 7192 | 69．7174 | $6 \cdot 100$ | 1212 | 1415 | 1618 | 1820 | 202 | 222 | 42 | 263 | 283 | 6 |
| 71 | 7298 | 80 | 7262 | 7244 | 7226 | 207 | 7189 | 7171 | 7152 | $70 \cdot 7$ | 6.1881 | 2086 | 229 | 2498 | 2704 | 2909 | 3115 | 3321 | 35 |  | 71 |
| 72 | 7260 | 7242 | 7224 | 7205 | 7187 | 7168 | 7150 | 7131 | 7112 | 717093 | 6.2752 | 296 | 3169 | 3378 | 358 | 3795 | 4004 | 4212 | 442 | 463 | 72 |
| 73 | 7222 | 7204 | 7185 | 7166 | 7148 | 129 | 7110 | 7051 | 7072 | 72.7053 | 6.3624 | 3835 | 4047 | 4258 | 4470 | 4681 | 4893 | 5104 | 531 | 532 | 73 |
| 74 | 7184 | 65 | 7146 | 7128 | 7109 | 90 | 7070 | 7051 | 7032 | 73.7013 | 6.4495 | 4710 | 4924 | 5139 | 5353 | 5567 | 5782 | 599 | 6211 | 6425 | 74 |
| 75 | 7146 | 7127 | 7108 | 7089 | 7069 | 50 | 703 | 7011 | 6992 | 74．6972 | $6 \cdot 5367$ | 5584 | 5801 | 6019 | 6236 | 6453 | 6671 | 6888 | 710 | 732 | 75 |
| 76 | 7108 | 88 | 7069 | 7050 | 030 | 7011 | 699 | 6972 | 6952 | 75.6932 | 6.6238 | 6459 | 6679 | 6899 | 7119 | 7339 | 7560 | 7780 | 80 | 822 | 76 |
| 77 | 7070 | 7050 | 7031 | 7011 | 6991 | 6972 | 6952 | 6932 | 6912 | $76 \cdot 6892$ | 6.7110 | 7333 | 7556 | 7779 | 8003 | 8226 | 8449 | 8672 |  |  | 77 |
| 78 | 7032 | 7012 | 6992 | 6972 | 6952 | 6932 | 6912 | 6892 | 6872 | $77 \cdot 6851$ | $6 \cdot 7981$ | 8207 | 8434 | 8660 | 8886 | 9112 | 9338 | 9564 | 979 | －016 | 78 |
| 79 | 6994 | 6974 | 6954 | 6933 | 6913 | 6893 | 6872 | 6852 | 6831 | 78.6811 | $6 \cdot 8853$ | 9082 | 9311 | 9540 | 9769 | 9998 | － 226 | 0455 | 06 | 091 | 79 |
| 80 | 6956 | 6935 | 6915 | 6895 | 687 | 6854 | 6833 | 6812 | 6791 | 79.6770 | 6.9725 | 9956 | －188 | 0420 | 065 | 088 | 1115 | 134 | 157 | 181 | 80 |
| 81 | 6918 | 6897 | 6876 | 6856 | 6835 | 6814 | 6793 | 6772 | 6751 | $80 \cdot 6730$ | $7 \cdot 0596$ | 0831 | 1066 | 1300 | 1535 | 1770 | 2004 | 2239 | 247 | 270 | 81 |
| 82 | 6880 | 6859 | 6838 | 6817 | 6796 | 6775 | 6754 | 6732 | 6711 | 81.669 | 71468 | 1705 | 1943 | 2181 | 2418 | 2656 | 2893 | 3131 | 336 | 360 | 82 |
| 83 | 6842 | 6821 | 6799 | 6778 | 6757 | 6736 | 6714 | 6693 | 6671 | 82.6649 | $7 \cdot 2339$ | 2580 | 2820 | 306 | 3301 | 3542 | 3782 | 4023 | 426 | 450 | 83 |
| 84 | 6804 | 6782 | 6761 | 6739 | 6718 | 6696 | 6675 | 6653 | 6631 | 83.6609 | $7 \cdot 3211$ | 3454 | 3698 | 3941 | 4184 | 4428 | 4671 | 4915 | 5158 | 5401 | 84 |
| 85 | 67 | 6744 | 6722 | 6701 | 6679 | 6657 | 6635 | 6613 | 6591 | $84 \cdot 6569$ | 4082 | 432 | 4575 | 4821 | 5068 | 531 | 5560 | 580 | 5083 | 6299 | 85 |
| 86 | 6727 | 6706 | 6684 | 6662 | 6640 | 6618 | 6595 | 6573 | 6551 | ${ }^{85.6528}$ | $7 \cdot 4954$ | 5203 | 5452 | 55702 | 5951 | 6200 | 6449 | 6698 | 694 |  | 87 |
| 87 | 6689 | 6667 | 6645 | 6623 | 6601 | 6578 | 6556 | 6533 | 6511 | 86.6488 | $7 \cdot 5825$ | 6078 | 6330 | 6582 | 6834 | 7086 | 7338 | 7590 | 7842 | 809 | 87 |
| 88 | 6651 | 6629 | 6607 | 6584 | 6561 | 6539 | 6516 | 6493 | 6470 | 87.6448 | $7 \cdot 6697$ | 6952 | 7207 | 7462 | 7717 | 7972 | 8227 | 8482 | 8737 | 899 | 88 |
| 89 | 6613 | 6591 | 6568 | 6545 | 6522 | 6500 | 6477 | 6454 | 6430 | 88．6407 | $7 \cdot 7569$ | 7826 | 8084 | 8342 | 8600 | 8858 | 9116 | 9374 | 9632 | 989 | 89 |
| 90 | 6575 | 6552 | 6529 | 6506 | 6483 | 646 | 6437 | 6414 | 6390 | 89：6367 | 7.8440 | 8701 | 8962 | 9223 | 9483 | 9744 | ＋005 | 026 | 0526 | 0787 | 90 |
| 91 | 6537 | 6514 | 6491 | 6468 | 6444 | 6421 | 6397 | 6374 | 6350 | 90.6326 | 7.9312 | 9575 | 9839 | 1103 | 0366 | 0630 | 0894 | 1157 | 142 | 168 | 91 |
| 92 | 6499 | 6476 | 6452 | 6429 | 6405 | 6382 | 6358 | 6334 | 6310 | 91．6286 | 8.0183 | 0450 | 0716 | 0983 | 1250 | 1516 | 1783 | 2049 | 231 | 25 | 92 |
| 93 | 6461 | 6437 | 6414 | 6390 | 6366 | 6342 | 6318 | 6294 | 6270 | 92.6246 | 8.1055 | 1324 | 1594 | 1863 | 2133 | 2402 | 2672 | 2941 | 321 | 348 | 93 |
| 94 | 6423 | 6399 | 6375 | 6351 | 6327 | 6303 | 6279 | 6254 | 6230 | 93．6205 | 8.1926 | 2199 | 2471 | 2744 | 3015 | 3288 | 3561 | 3833 | 4105 | 4378 | 94 |
| 95 | 63 | 6361 | 6337 | 6312 | 6288 | 6264 | 6239 | 6214 | 6190 | 94．6165 | 8.2798 | 307 | 3349 | 3624 | 389 | 4174 | 4450 | 4725 | 5000 | 5275 | 95 |
| 96 | 6347 | 6323 | 6298 | 6274 | 6249 | 6224 | 6199 | 6175 | 6150 | 95．6125 | 8.3669 | 3948 | 4226 | 4504 | 4782 | 5060 | 5339 | 5617 | 5895 |  | 96 |
| 97 | 6309 | 6284 | 6259 | 6235 | 6210 | 6185. | 6160 | 6135 | 6110 | ${ }^{96 \cdot 6084}$ | 8.4541 | 4822 | 5103 | 5384 | 5665 | 5946 | 6227 | 6508 | 679 | 7071 | 97 |
| 98 | 6271 | 6246 | 6221 | 6196 | 6171 | 6146 | 6120 | 6095 | 6069 | 97．6044 | 8.5413 | 5697 | 5981 | 6265 | 6549 | 6833 | 7116 | 7400 | 7684 | 7968 | 98 |
|  | 6233 | 6208 | 6182 | 57 | 6132 | 6106 | 6081 | 6055 | 6029 | 98：6003 | 8.6284 | 6571 | 6858 | 7145 | 7432 | 7719 | 8005 | 8292 | 8579 | 8866 | 99 |
| 100 | 6195 | 6169 | 6144 | 6118 | 6093 | 6067 | 6041 | 6015 | 5989 | 99.5963 | 8.7156 | 7446 | 7735 | 8025 | 8315 | 8605 | 8894 | 9184 | 9474 | 9764 | 100 |
|  | $60^{\circ}$ | $55^{\prime}$ | 58 | ｜ $5{ }^{-1}$ | 56 | 55 | $54^{\prime}$ | $53^{\prime}$ | $52^{\prime}$ | $51^{\prime}$ | 60 | $59^{\prime}$ | $58^{\prime}$ | 57 | $56^{\prime}$ | 55＇ | $54^{\prime}$ | $53^{\prime}$ | $52^{\prime}$ | $51^{\prime}$ |  |
| 84 |  |  |  |  |  | NE． |  |  |  |  |  |  |  |  |  | INE． |  |  |  |  | $84^{\circ}$ |

TRAVERSE TABLES．

| 5 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $5^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $12^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $5^{\prime}$ | $16^{\prime}$ | $17^{\prime}$ | 18 | $19^{\prime}$ | $10^{\prime}$ | 11 | 12 | 13＇ | 14 | $15^{\prime}$ | 16 | 17 | 18 | 9 |  |
|  | 9959 | 99 | 99 | 99 | 995 | 995 | 99 | 99 | 9957 | 9957 | 090 | 0903 | 0906 | 0909 | 0912 | 0915 | 0918 | 0921 | 0924 |  |  |
|  |  | 9918 | 99 | 9917 |  | 9916 |  |  |  | 991 | 180 | 180 | 181 | 1818 | 182 | 183 | 183 | 1842 | 847 |  |  |
|  | 9878 | 987 | 9877 | 9876 | 9875 | 987 | 987 | 9873 | 9872 |  | 702 | 2710 | 2719 | 2728 | 2736 | 274 | 2754 | 2762 | 277 |  |  |
|  |  | 9836 | 9835 | 9834 | 9833 | 9832 | 981 | 迷 | 9829 |  | 602 | 3614 | 3625 | 3637 | 3648 | 3660 | 3672 | 3683 | 269 |  |  |
| 5 | 9797 |  |  |  |  |  |  |  | 9786 |  | 4503 | 4517 | 4532 | 454 | 45 | 4575 | 4590 | 4604 | 461 | 4633 |  |
| 6 | 9756 | 9755 | 9753 | 9751 | 9750 | 9748 | 9747 |  | 9743 | 5.9742 | 5403 | 5421 | 5438 | 545 | 5473 | 5490 | 550 | 5525 | 5542 |  |  |
|  | 971 | 97 | 971 | 9710 | 97 | 970 | 97 |  |  |  | 804 | 632 | 63 | 63 | 6385 | 6405 | 6425 | 6446 | 6466 |  |  |
|  | 96 | 9673 | 96 |  | 9667 | 966 | 9662 | 9660 | 9658 | 965 | 204 | 72 | 72 | 727 | 729 | 73 | 73 | 7366 | 739 | 7413 |  |
|  | 9634 | 9632 | 963 | 9 | 9625 | 962 | 962 | 961 | 9615 |  |  | 81 | 8157 | 818 | 820 | 8235 |  | 828 | 8313 |  |  |
| 10 | 9594 | 9591 | 9588 | 9586 | 9583 | 80 | 9578 | 9575 | 72 | ． 9570 | 005 | 34 | 90 | 9092 | 912 | 915 | 9179 | 9208 | 923 | 926 |  |
| 11 | 9553 | 955 | 9547 | 95 | 9541 | 9539 | 9536 | 19533 | 30 | 10 | 906 | 9938 | 9970 | － | 00 | 0065 | 0097 | 0129 | 0161 | 019 |  |
| 12 | 9512 | 95 |  |  | 9500 | 9497 | 9493 | 90 | 9487 | 1294 | 080 |  | 08 |  |  | 098 | 1015 | 105 | 1084 |  |  |
| 13 | 9472 | 9468 | 946 | 9462 | 9458 | 9455 | 9451 | 48 | 9444 | 12.9 | 1.170 | 174 | 1782 | 1820 | 1858 | 18 | 193 | 1971 | 200 |  |  |
| 14 | 9431 | 942 | 94 | 9420 | 16 | 9413 | 94 | 9405 |  | 13.93 | 26 | 264 | 26 | 2729 | 27 | 2810 | 285 | 289 | 293 | 297 |  |
| 15 | 9391 | 938 |  |  |  |  |  |  |  |  |  |  |  |  | 3682 | 37 | 37 | 3812 | 3856 |  |  |
| 16 | 93 | 9346 | 9342 | 9337 | 9333 | 9329 | 9325 |  |  | 15.9312 | $\cdot 4409$ | 4455 |  |  | 594 | 4640 | 4687 | 4733 |  |  |  |
| 17 | 930 | 9305 | 9300 | 9296 | 92 | 928 | 9282 | 9278 | 92 | 16.9 | 5309 | 5358 | 54 | 54 | 55 | 55 |  | 5654 | 5703 | 575 |  |
| 18 | 9269 | 92 |  |  | 9250 |  |  |  | 923 | 17.922 | 6210 |  | 63 | 63 | 析 | 6470 | 6522 | 657 | 66 | 66 |  |
| 19 | 922 | 922 | 92 |  | 9208 |  |  |  | 9188 |  |  | 7165 | 7220 | 727 | 33 | 73 | 7440 | 7495 | 755 |  |  |
| 20 | 9187 | 918 | 9177 | 9172 | 9166 | 9161 | 9156 | 9150 | 9145 | 19 | $1 \cdot 801$ | 806 | 8127 | 8184 | 8242 | 8300 | 8358 | 841 | 847 | 353 |  |
| 21 | 914 | 9141 |  | 9130 | 9125 | 9119 | 9113 | 9108 | 9102 | 20．9097 | 1.8911 | 89 | 903 | 909 | 915 | 9215 | 9276 | 9337 | 939 | 945 |  |
| 22 | ， | 9100 |  |  |  |  |  |  |  | 21.90 |  | 9875 |  |  | 0067 | 0130 | 0194 | 0258 |  |  |  |
| 23 | 9066 | 9059 | 90 | 9047 | 9041 | 9035 | 90 | 9023 | 901 | 22.90 | 07 | 07 | O8 | 09 | 0979 | 104 | 1112 | 1179 | 124 | 13 |  |
| 24 | 902 | 90 | 9012 |  |  |  |  |  | 974 | 23 | $2 \cdot 161$ | 16 | 17 | 182 | 189 | 1960 | 2030 | 209 | 21 | 22 |  |
| 25 | 8984 |  | 8971 |  | 8958 |  |  |  |  |  |  |  |  |  | 2803 | 2875 |  |  |  | 316 |  |
| 26 | 894 | 8937 | 8930 | 8923 | 8916 | 8909 |  |  | 8888 | $25 \cdot 888$ | ． 3414 |  |  | 3640 | 3715 | 379 |  |  |  |  |  |
| 27 | 89 | 889 | 888 |  |  |  |  | 8853 | 8846 |  |  |  |  | 454 | 46 | 470 | 4784 | 4862 | 494 | 50 |  |
| 28 | 886 |  |  |  |  |  |  |  |  |  | 2.521 |  |  | 545 | 5539 | 5620 | 5702 | 5783 | 58 |  |  |
| 29 | 882 | 88 | 880 | 8799 | 91 | 87 | 87 | 8768 | 8760 | 28.875 | 2.61 | 6199 | 6283 | 6367 | 64 | 6535 | 6619 | 6703 | 678 | 687 |  |
| 30 | 8781 | 87 | 8765 | 8757 | 8749 | 8741 | 8733 | 25 | 717 | 29 | $2 \cdot 70$ | 71 | 71 | 727 | 73 | 7450 | 753 | 762 | 771 | 77 |  |
| 31 | 87 | 8732 |  |  |  |  |  |  |  |  |  | 8006 |  |  | 827 |  | 8455 |  | 8635 | 8725 |  |
| 32 | 870 | 869 | 86 |  |  | 865 |  |  |  | 31－86 |  |  |  |  |  |  |  |  |  |  |  |
| 33 | 865 | 865 | 86 | 8633 | 8624 | 8616 | 8607 | 8598 | 858 | $32 \cdot 8$ | $2 \cdot 971$ | 9813 |  | －002 | 0100 | 0196 | 0291 | 038 | 048 | 05 |  |
| 34 | 8619 | 86 |  |  |  |  |  | 556 | 8546 | $33 \cdot 853$ | 3.0618 | 07 |  | 0914 | 10 | 11 | 1209 | 13 | 140 |  |  |
| 35 | 8578 |  | 856 | 8550 |  | 8532 |  | 13 |  |  |  |  |  | 182 |  |  | 2127 | 228 | 233 |  |  |
| 36 | 853 | 852 | 85 | 8509 | 8499 | 8490 | 8480 | 8471 | 8461 | 35.845 | 3.241 | 252 |  |  |  |  |  |  |  |  |  |
| 37 | 849 | 848 |  |  | 8458 | 844 |  |  |  |  |  |  |  |  |  |  |  |  | 417 |  |  |
| 38 | 845 | 8446 | 843 |  | 8416 | 840 |  | 8386 | 8375 | 37•83 | 3.42 |  |  | 4550 |  |  |  | 4991 |  |  |  |
| 39 | 841 | 840 | 839 | 8385 | 8374 | 836 | 8354 | 8343 | 8333 |  |  | 52 | 5347 | 54 | 55 | 5686 | 5799 | 59 | 602 | 613 |  |
| 40 | 8375 | 8364 | 8354 | 8343 | 8333 | 8322 | 8311 | 8301 | 290 | 39.827 | 3．6021 | 613 | 625 | 63 | 64 | 66 | 67 | 683 | 69 | 70 |  |
| 41 | 8334 | 8323 | 831 |  | 8291 |  |  |  |  | 40.823 | $3 \cdot 692$ |  |  |  |  | 751 |  |  |  |  |  |
| 42 | 829 | 828 |  |  | 8249 | 823 |  | 8216 | 8204 | 41.819 | $3 \cdot 78$ |  |  | 818 |  | 843 |  |  |  |  |  |
| 43 | 825 | 8242 | 823 | 8219 | 8208 |  |  | 8173 | 8162 | $42 \cdot 815$ | 3．872 |  | 8972 | 909 |  | 93 | 9470 | 959 | 971 |  |  |
| 44 | 12 |  |  |  |  |  |  |  | 8119 | $43 \cdot 810$ | 3.962 |  | 98 | ＋0 |  | 02 | 0388 | 0516 |  |  |  |
| 45 | 8172 |  |  |  |  |  |  |  |  |  | ， |  |  | 09 |  |  |  | 436 |  |  |  |
| 46 | 813 |  |  |  |  |  |  |  |  |  | 4.142 |  |  | 182 |  |  |  | 2357 | 42 |  |  |
| 47 | 80 | 807 |  |  |  |  |  |  |  |  | 4.23 |  |  |  |  |  |  |  |  |  |  |
| 48 | 805 |  |  | 8012 | 7999 | 798 | 7974 | 7961 | 7948 | $47 \cdot 793$ | 4.32 |  |  |  |  |  |  |  |  |  |  |
| 49 |  |  |  |  |  |  |  |  |  |  |  |  | 44 | 45 |  | 48 | 4978 | 5120 |  |  |  |
| 50 | 7969 | 7955 | 7942 | 7929 | 7916 | 7902 | 7889 | 7876 | 7862 | 49 | $4 \cdot 5$ | 51 | 5316 | 546 | 560 | 575 | 589 | 604 | 6185 | 633 |  |
| 51 | 7928 |  |  |  | 7874 |  |  |  | 782 | 50.78 | 4.5927 |  |  |  |  |  |  |  |  |  |  |
| 52 | 788 | 787 | 78 | 7846 | 标 | 78 | 7805 | 7791 | 777 | 51.7 | 68 | 69 |  | 728 | 74 |  |  |  |  |  |  |
| 53 | 78 | 783 |  |  |  |  |  |  | 7734 | 52 | $4 \cdot 77$ |  |  |  | 83 | 84 |  |  |  | 91 |  |
| 54 | 78 | 7792 |  |  | 49 |  | 研 | 7706 |  | 53 | 4.86 |  | 8942 | 909 | 92 | 94 | 9567 | 9724 |  |  |  |
| 55 | 7765 | 775 | 77 | 7722 | 7707 |  | 7678 |  |  | 63 | 4.95 |  |  | ＋007 | 010 | 032 | 0485 |  |  |  |  |
| 56 | 772 | 771 |  |  |  |  |  |  |  |  |  |  | 07 | 09 | 10 |  |  |  | 1728 |  |  |
| 57 | 768 |  |  |  | 7624 | 760 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 764 | 7628 | 761 | 7598 | 7582 | 756 | 7551 | 7536 | 20 | 57 | 5.223 |  |  | 273 | 2903 |  |  |  |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  |  |  |  | 34 | 36 | 38 |  | 41 |  | 44 |  |  |
| 60 | 7562 | 7546 | 753 | 7515 | 7499 | 7483 |  | 7451 | 35 | 59 | 5. |  | 4380 | 455 | 472 | 4901 | 5075 | 524 | 5422 | 55 |  |
| 61 | 752 |  |  |  |  |  |  |  | 7392 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 748 |  |  |  | 7416 | 73 |  | 7366 | 734 | 61.733 | ． 58 |  |  | 63 | 65 | 6731 |  |  |  |  |  |
| 63 | 74 | 742 |  |  | 737 | 73 |  | 231 | 7307 | $62 \cdot 72$ | 5.67 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 7332 |  |  |  |  |  |  |  | 8005 |  |  |  | 8746 |  |  |  |  |
| 65 | 735 | 7342 |  |  | 729 | 727 |  | 7238 | 7221 | 64 |  |  |  |  |  | 947 | 966 |  | －0 | 02 |  |
| 66 | 7318 | 7301 |  |  |  |  |  |  |  |  |  |  |  | ＋009 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 6.03 |  |  |  |  |  |  |  |  |  |  |
| 68 | 723 | 72 | 720 | 7183 | 7165 | 714 | 7129 | 7111 | 㖪 | $67 \cdot 707$ | 6.12 | 143 | 163 | 182 | 20 | 222 | 2418 | 261 |  |  |  |
| 69 | 7197 | 71 |  |  | 24 |  |  |  | 7050 | 68.703 | 6.2 |  |  | 27 |  | 31 | 33 | 35 |  |  |  |
| 70 | 715 | 713 |  |  | 82 |  |  |  |  | 69.698 | 6.3037 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7075 | 705 | 703 | 7018 | 69 |  |  | 694 | 6922 | 71.690 | 6.48 |  | 52 | 546 | 567 | 58 | 60 | 629 | 650 | 675 |  |
|  | 703 |  |  |  |  |  |  | 6899 | 6879 | $72 \cdot 68$ | ． 57 |  | 6162 | 6373 | 658 | 679 | 砣 | 7219 | 74 | 764 |  |
|  | 6993 | 697 | 69 | 35 | 6915 | 689 | 6876 | 6856 | 6836 | 73.681 | 6.663 | 6854 | 7068 | 7283 | 749 | 771 | 7926 | 814 | 83 |  |  |
| 75 | 69 | 6933 |  |  | 6874 | 6854 | 6834 | 6814 | 6794 | 74：6773 | 6.75 | 775 | 7974 | 819 | 840 | 86 | 88 | 9061 | 9278 | 94 |  |
| 76 | 69 | 68 | 6872 | 6852 | 67 | 6812 |  | 6771 | 6751 | $75 \cdot 673$ | ．844 | 866 | 8881 | 1010 | 9321 | 954 | 976 | 998 | ， | 042 |  |
|  |  | 6 |  |  | 63 |  |  | 672 | 670 | －668 | 6.9341 | 966 |  | －01 | 0233 | 245 | 067 |  |  |  |  |
| 78 | 6831 | 6810 | 679 | 6769 | 6749 | 672 | 670 | 6686 | 6665 | $77 \cdot 664$ | $7 \cdot 02$ | 046 | 0693 | 091 | 114 | 137 | 159 | 182 | 20 | 221 |  |
| 79 | 6790 | 616 |  |  | 6707 |  |  | 644 | 6623 | 78\％660 | 7．114 | 137 | 1600 | 182 | 205 | 228 | 251 | 2744 | 297 | 320 |  |
| 80 | 6750 | 6729 | 6708 | 6686 | 6665 | 6644 | 6623 | 6601 | 6580 | 79.655 | －2043 |  | 2506 | 273 | 297 | 3201 | 343 | 析 | 389 |  |  |
|  |  | 668 | 666 | 6645 | 6624 | 660 | 658 | 6559 | 6537 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 666 | 664 | 662 | 660 | 65 | 65 | 6538 | 6516 | 6494 | 81．647 | 7.38 | 408 | 4319 | 455 | 479 | 503 | 526 | 550 | 5 |  |  |
|  | 662 | 6606 |  | S | 6540 | 6518 |  | 647 | 4 2 | 82.64 | 7474 |  | 522 | 546 | 570 | 5946 | 187 | 642 | 666 |  |  |
| 8 | 658 | 6565 | 6543 | 6521 | 6498 | 6476 | 645 | 6431 | 6409 | 83.638 | 7.56 | 588 | 6131 | 637 | 66 | 686 | 710 | 734 | 759 | 7835 |  |
| 85 | 65 | 652 |  | 6479 | 6457 | 6434 |  | 6389 | 6366 | $84 \cdot 6343$ | 7.65 | 6791 | 7038 | 7284 | 7530 | 77 | 8023 | 8269 | 8515 | 876 |  |
| 86 | 65 | 648 | 64 | 438 | 641 | 63 |  | 436 | 6323 | 85.630 | 74 | 7695 | 7944 | 8193 | 84 | 86 | 8941 | 9190 | 943 |  |  |
|  | 646 | 6442 | 64 | 6396 | 6373 | 635 | 6327 | 6304 | 628 | 25 | 7.8346 | 859 | 8850 | 102 | 932 | 960 | 885 | ，110 | 研 |  |  |
|  | 642 | 640 | 637 | 6355 | 6332 | 630 | 628 | 6261 | 6238 | 87．6214 | $7 \cdot 92$ | 950 | 9757 | －012 | 02 | 052 | 0776 | 103 | 128 |  |  |
|  | 6384 | 6361 | 6337 | 314 | 230 | 6266 | 243 | 6219 | 195 | 617 | 8.014 | 40 | 0663 | 092 | 117 | 143 | 169 | 1952 | 221 |  |  |
| 90 | 63 | 632 | 6296 | 6272 | 6248 | 622 | 6200 | 6176 | 152 | 89.612 | 8．1048 | 130 | 156 | 830 | 209 | 235 | 261 | 287 | 313 | 339 |  |
|  |  | 62 | 625 | 231 | 6207 | 6182 | 6158 | 6134 | 6109 | $90 \cdot 608$ | 8．1948 | 221 | 24 | 273 |  | 32 | 3530 | 保 | 405 |  |  |
| 92 | 626 | 623 | 6214 | 6189 | 6165 | 614 | 16 | 6091 | 6067 | 91－604 | 8.284 | 311 | 3382 | 364 | 39 | 418 | 4448 | 4714 | 498 |  |  |
|  | 6221 | 6197 | 6172 | 6148 | 612 | 60 | 603 | 6049 | 6024 | 92．599 | 8.3749 | 4019 | 4288 | 4558 | 482 | 5096 | 5366 | 5635 | 590 | \％ |  |
| 94 | 618 | 615 | 6131 | 107 | 608 | 605 | 603 | 6006 | 598 | $93 \cdot 595$ | 8.4650 | 4922 | 5195 | 5467 | 57 | 60 | 6284 | 6556 | 682 |  |  |
| 95 | 61 | 6115 |  |  |  | 6015 |  |  | 5938 | 94.5913 | 8.5551 | 5826 | 610 | 637 | 665 | 69 | 720 | 747 | 775 | 802 |  |
| 96 | 6100 | 607 |  |  |  | 593 |  |  |  |  |  |  | 仡 | 285 |  |  | 8120 |  | 析 |  |  |
|  | 605 | 603 | 6008 | 5982 | 5957 | 5931 | 5905 | 5879 | 5853 | 965827 | 352 | 7633 | 7914 | 8195 | 84 | 8757 | 9038 | 9318 | 959 | ） |  |
| 9 | 6018 | 599 | 59 | 5941 | 5915 | 5889 | 5863 | 5836 | 5810 | 97－578 | 8.825 | 853 | 8820 | 910 | 938 | 9672 | 9955 | ＋239 | 052 |  |  |
|  | 5978 | 595 | 5926 | 989 | 132 | 5847 | 5821 | 5794 | 5767 | 98.5741 | 153 | 9439 | 9726 | －013 | 0300 | 0587 | 0873 | 160 | 44 | 73 |  |
| 100 | 5937 | 5911 | 5884 | 5858 | 5832 | 5805 | 5778 | 5752 | 5725 | 99.5698 | －0053 | 0343 | 0633 | 0922 | 1212 | 1502 | 1791 | 2081 | 2371 | 2660 | 100 |
|  | $50^{\prime}$ | $45^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | 46 | 45 | 44 | 43 | 42 | 41 | $50^{\prime}$ | $49^{\prime}$ |  | $47^{\prime}$ | 46 | 45 | $44^{\prime}$ | $43^{\prime}$ | $42^{\prime}$ | $41^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $5^{\circ}$ | OSINE． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $21^{\prime}$ | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | 26 | $27^{\prime}$ | $28^{\prime}$ | 29 |  | 21 | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 | $28^{\prime}$ | 29 |  |
|  |  | 9956 | 99 |  | 995 | 99 |  |  | 99 | ． 995 | 0929 | 0932 | 0935 |  | 0941 | 0944 | 0947 | 0950 | 0953 |  |  |
|  | 99 | 9913 | 9912 | 9912 | 9911 | 991 | 99 | 9910 |  | 1.99 |  | 186 | 1 |  | 1882 |  | 1894 |  | 5 |  |  |
|  | 9870 | 986 | 986 | 868 | 9867 | 986 | 986 | 9864 | 98 | 2.98 | 2788 | 2797 | 28 | 2815 | 28 | 28 | 28 | 28 | 28 | 2867 |  |
|  | 9827 | 9826 | 9825 | 9824 | 9822 |  |  | 19 | 9818 | 5 |  | 373 | 37 | 37 | 3764 | 37 | 3788 | 3799 | 3811 | 3822 |  |
|  | 9784 |  |  |  |  |  |  |  |  |  |  |  |  |  | 4705 |  | 434 | 4749 | 3 | 4778 |  |
|  | 974 | 9739 | 9737 | 9735 | 9734 | 9732 | 9730 | 9729 | 9727 | 5.9725 | 5577 | 5594 | 5612 | 562 | 5646 | 5664 | 5681 | 5699 | 5716 | 5733 |  |
|  | 9697 | 969 | 969 | 96 | 96 | 9687 | 9685 | 9684 | 9682 | 6.96 |  | 6527 | 6547 | 656 | 6588 | 6608 | 8 |  | 6669 | 6689 |  |
|  |  | 965 | 964 | 9647 | 析 |  |  |  |  |  |  | 7459 |  |  | 7529 | 75 | 7575 | 7598 | 762 | 76 |  |
|  | 961 | 9608 | 960 |  | 9601 |  | 95 | 9593 | 9591 |  |  | 839 | 84 | 844 | 847 | 84 | 85 | 8548 | 857 |  |  |
| 10 | 9567 | 9564 | 9562 | 9559 | 9556 | 9553 | 955 | 9548 | 9545 | 9954 | 295 | 9324 | 935 | 38 | 9411 | 944 | 946 | 9498 | 9527 | 55 | 10 |
| 11 | 9524 | 9521 | 9518 | 9515 | 9512 |  |  |  |  | 10.9 | 1.0224 |  |  | 0320 | 03 | 03 | 04 | 0447 | 047 | 051 |  |
| 12 | 948 | 947 |  |  |  |  |  |  |  | 11. | 115 | 118 |  |  | 1293 | 1328 |  |  | 1432 | 146 |  |
| 13 | 943 | 943 | 943 | 9427 | 94 | 94 | 94 | 9412 | 94 |  | 2083 | 21 | 21 | 21 | 223 | 227 | 23 | 23 | 2385 | 242 |  |
| 14 | 9394 | 9390 | 93 |  | 9379 |  | 93 | 9367 |  | 13 | 30 | 305 | 30 | 31 | 31 | 32 | 32 | 3297 | 333 | 337 |  |
| 15 | 9351 | 9347 | 9342 |  | 9334 | 9330 | 9326 | 9322 | 9318 | 14.931 | － 3942 | 3986 | 4029 | 4073 | 4116 | 416 |  | 4247 | 429 | 433 |  |
| 16 | 930 | 9303 | 9299 | 9294 | 9290 | 9286 | 928 | 9277 | 9272 | 15.926 | － 4872 | 4918 | 4965 | 5011 | 5057 | 5104 | 5150 | 519 | 5243 |  | 16 |
| 17 | 9264 | 925 | 9255 | 9250 | 920 | 9 |  | 9232 | 9227 | 16.92 |  |  |  |  | 59 | 6048 | 6097 | 6146 | 6195 | 624 | 17 |
| 18 | 9221 |  |  |  | 9201 | 91 | 91 | 9186 |  | 17.91 | 6731 | 67 | 68 | 68 | 693 | 699 | 70 | 7096 | 14 | 720 |  |
| 19 | 9177 | 91 | 9167 | 9162 | 9157 | 91 | 9146 | 9141 | 36 | 18 | －7660 | 7716 | 77 | 78 | 7881 | 7936 | 7991 | 8046 | 8101 | 815 |  |
| 20 | 9134 |  | 91 | 9118 | 9112 | 10 | 10 | 9096 | 9090 | 19 | 18590 | 8648 | 87 | 87 | 8822 | 888 | 893 | 8995 | 905 | 911 | 20 |
| 21 | 909 |  | 907 | 907 |  |  |  |  |  |  |  |  |  | 9702 | 9763 | 9824 | 988 | 9945 | 1006 | 006 |  |
| 22 | 9048 |  |  |  |  |  |  |  |  |  |  |  | 0576 | 0640 | 0704 | 0768 |  |  |  |  |  |
| 23 | 90 | 8998 | 89 | 898 | 89 | 89 | 89 | 8960 | 8954 | $22 \cdot 89$ | 1378 | 1445 | 15 | 15 | 1645 | 17 | 177 | 184 | 1911 | 197 | 23 |
| 24 | 896 |  |  |  |  | 89 |  |  | 8908 | $23 \cdot 89$ | 2308 | 237 | 24 | 25 | 25 | 265 | 27 | 2795 | 28 | 293 |  |
| 25 | 8918 |  |  |  |  |  |  |  |  |  |  | 331 |  |  |  |  |  |  | 3817 |  |  |
| 26 | 8874 | 8867 | 8860 | 8853 |  | 8839 | 883 | 8825 | 8817 | 25.8810 | $2 \cdot 416$ | 4242 | 4318 | 439 |  | 454 |  |  |  |  | 26 |
| 27 | 883 | 8824 | 8816 | 8809 |  | 8794 |  |  | 8772 |  |  | 517 | 52 | 533 | 5409 | 548 | 5566 |  | 5722 |  |  |
| 28 | 87 |  |  |  |  |  |  |  | 8727 | 27 |  | 610 | 61 | 62 | 63 | 643 | 65 | 6594 | 6675 | 675 |  |
| 29 | 8745 | 8737 | 87 | 8721 | 8713 | 8705 | 8697 | 8689 | 8681 | 28 | 695 | 7039 | 7123 | 7207 | 7291 | 7375 | 745 | 75 | 762 | 771 | 29 |
| 30 | 87 | 8693 | 8685 | 8677 | 8669 | 8660 | 8652 | 8644 | 8636 | 29 | 2.7885 | 79 | 80 | 81 | 8232 | 831 | 840 | 84 | 858 | 366 | 30 |
| 31 | 8658 | 8650 | 864 | 863 | 8624 | 8616 |  |  | 8590 | 30.858 | 2.8814 | 8904 | 8994 | 9084 | 9174 | 926 | 935 | 9443 | 9533 | 962 | 31 |
| 32 | 8615 |  |  |  |  | 857 |  |  |  | 31.85 |  | 98 |  |  | 0115 | 0207 |  |  |  |  |  |
| 33 | 857 | 8562 | 85 | 8544 | 85 | 85 | 85 | 85 | 8499 | 32.849 | 3．067 | 07 | 086 |  | 105 | 115 | 12 | 134 | 143 | 53 |  |
| 34 | 8528 |  |  |  |  | 84 | 84 |  | 8454 |  | $3 \cdot 1603$ | 170 |  |  | 19 | 209 | 21 | 22 | 239 | 248 |  |
| 35 | 8485 |  |  |  |  |  |  |  |  |  |  | 2634 |  |  | 293 | 30 |  | 3242 | 3343 |  |  |
| 36 | 844 | 8432 | 8422 | 841 | 8402 | 8392 |  |  |  | 35.835 |  |  |  | 377 | 387 |  |  |  |  |  | 36 |
| 37 | 83 | 8388 | 837 |  |  | 8348 |  |  |  |  |  |  |  | 47 | 482 | 492 | 503 |  |  |  |  |
| 38 | 835 | 8345 | 83 |  | 8314 | 8303 |  |  | 827 |  |  | 543 |  | 56 |  | 58 |  | 6091 | 6201 |  |  |
| 39 | 8312 | 8301 | 82 |  | 8269 | 8258 | 82 | 8237 | 8226 |  |  | 63 | 64 | 65 | 670 | 68 | 692 | 704 | 20 | 726 |  |
| 40 | 8268 | 8257 | 8247 | 8236 | 8225 | 8214 | 82 | 8192 | 8181 | 39 | $3 \cdot$ | 729 | 74 | 75 | 76 | 775 | 787 | 799 | 810 | 822 | 40 |
| 41 | 82 | 8214 |  |  |  |  |  |  |  | 40.81 | $3 \cdot 810$ | 822 |  | 8466 | 8584 | 8703 |  | 8941 | 9059 |  | 41 |
| 42 | 8182 | 81 | 81 |  | 8136 | 812 | 81 | 8101 |  |  |  | 916 |  | 9404 |  |  |  |  |  |  |  |
| 43 | 8138 | 81 | 81 | 8103 | 8092 | 8080 | 806 | 8056 |  |  |  | ＋0 | 02 | 0342 | 046 | 05 | 07 | 0840 |  |  |  |
| 44 | 809 | 8083 |  |  |  | 8035 |  |  |  |  | 4.0898 | 102 | 11 | 12 | 14 | 153 | 166 | 17 | ， | 204 |  |
| 45 | 8052 |  |  |  |  |  |  |  |  | 44.79 | 41827 | 1958 |  |  | 234 | 247 |  |  | 2870 |  | 45 |
| 46 | 8009 |  |  |  |  |  |  |  |  | 45.789 |  | 289 |  |  |  |  |  | 36 |  |  | 46 |
| 47 | 796 | 7953 |  | 792 |  |  |  |  |  |  |  |  |  |  | 423 | 436 |  | 463 |  |  |  |
| 48 | 7922 | 7909 | 789 | 7883 | 7870 | 785 | 7843 | 7830 | 7817 | 47 | $4 \cdot 46$ | 475 | 4894 | 50 |  |  |  |  | 5728 | 58 |  |
| 49 | 7879 |  |  |  |  |  |  |  | 777 |  |  | 56 |  |  | 6113 | 625 | 639 | 653 | 668 | 682 |  |
| 50 | 78 | 7822 |  | 7795 | 7781 | 7767 | 7754 | 7740 | 7726 | 49.7712 | 4.64 | 662 | 676 | 69 | 7054 | 719 | 734 | 6s | 683 | 77 |  |
| 51 | 7792 | 7778 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 77 | 773 | 77 | 770 | 769 | 7678 | 7664 | 76 |  | 51.762 |  | 848 |  |  | 8936 | 908 |  |  |  |  |  |
| 53 | 77 | 769 | 76 |  |  |  |  |  |  | 52 |  | 94 |  |  | 98 | ＋031 |  | 03 | 049 | 06 |  |
| 54 | 7662 | 48 | 33 |  |  |  |  |  |  |  |  |  |  |  | 0818 |  |  |  |  | 160 |  |
| 55 | 761 |  | 7589 |  |  |  | 7529 |  |  | 54.74 |  | 128 |  | 1600 | 1760 | 19 |  |  |  |  |  |
| 56 | 75 |  |  |  |  |  |  |  |  |  |  | 2214 |  |  |  |  |  |  |  |  | $\frac{56}{56}$ |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 446 |  |
| 58 | 74 | 74 | 7458 |  | 7426 | 7410 | 7394 | 7378 | 7362 | 57 |  | 40 |  |  |  | 475 |  |  |  |  |  |
| 59 | 7446 |  |  |  |  |  |  |  | 73 |  | $5 \cdot 48$ | 50 |  | 53 | 55 | 569 | 58 | 603 | 620 | 637 |  |
| 60 | 7402 | 7386 | 7370 | 735 | 7337 | 7321 | 7304 | 7288 | 727 | 59.725 | 5.57 | 5944 | 61 | 6291 | 6465 | 663 | 681 | 698 | 7160 |  | 60 |
| 61 | 7359 | 734 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 731 | 729 | 72 |  | 7248 | 7231 | 721 | 71 | 718 | $1 \cdot 7$ |  | 78 |  |  |  |  |  |  |  |  |  |
| 63 |  | 725 |  |  | 7204 |  |  | 7152 |  | 627 | 5 | 874 |  |  |  | 9471 |  |  | －01 | 020 |  |
| 64 | 722 | 7212 | 719 |  | 7160 |  |  |  |  |  |  |  |  |  | 228 | 04 |  |  |  |  |  |
| 65 | 71 |  |  |  | 7115 |  |  |  | 704 | 64－702 | 6.041 | 060 | 07 | 098 | 1170 | 135 |  |  |  |  |  |
| 66 | 714 | 71 |  |  |  |  |  |  |  |  | 6.13 | 1538 | 17 | 19 |  | 23 | 249 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 24 |  | 28 |  | 22 |  |  |  | 402 |  |
| 68 | 705 | 7038 | 7019 |  | 6982 | 6963 | 69 | 692 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 69 |  | 6994 | 69 |  |  | 6919 |  |  | 686 | 68.684 | 6.41 | 433 |  | 47 | 49 | 513 | 53 | 55 | 58 | 593 |  |
| 70 | 6970 | 6951 | 693 |  |  |  |  |  | 6816 | $60 \cdot 679$ | $6 \cdot 5065$ | 526 |  | 565 | 5876 | 607 | 6281 | S | 65 | 688 |  |
| 71 | 6926 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 68 | 68 | 68 | 682 | 68 | 67 |  | 67 | 6725 | $71 \cdot 67.0$ | 6 | ， |  |  |  |  |  |  |  |  |  |
| 73 |  |  |  |  |  |  |  | 6700 | 6680 | $72 \cdot 666$ | 6.78 | 8065 | 827 | 848 | 869 | 891 | 912 | 933 | 95 | 97 |  |
| 74 | 6796 | 6776 | 675 | 67 | 6716 | 6696 | 66 |  |  |  |  | 997 |  |  | 964 | 985 |  |  |  | 071 |  |
| 75 | 6753 |  | 67 |  | 6672 |  | 6630 | 6610 |  | 74.656 | 6.9712 | 993 | ＋14 |  | 058 | 079 | 101 | 12 |  |  |  |
| 76 | 67 | 6689 | 66 |  |  |  | 6585 |  | 6543 | $75 \cdot 65$ | 7.0642 | 0862 | 108 |  | 152 | 174 | 19 | 218 |  | 杖 |  |
| 77 | 663 | 664 |  |  |  |  |  |  |  | 76.64 | 71571 | 1794 | 201 |  |  | 268 |  | 3 | 33 | 35 |  |
| 78 | 662 | 660 | 658 | 656 | 6538 | 651 | 6495 | 6474 | 645 | 77.643 | $7 \cdot 250$ | 2727 | 295 | 31 | 340 | 363 |  |  |  |  |  |
|  |  |  |  |  |  | A |  | 6 | 6407 | 78.638 | 7.3430 | 365 | 388 | 41 | 4346 | 457 | 480 | 50 | 526 | 54 |  |
| 8 | 6537 | 6515 | 6493 | 647 | 6450 | 6428 | 64 |  | 6361 | 79.6339 | $7 \cdot 4360$ | 459 | 砣 | 5055 | 5 | 55 | 57 | 5982 | 6213 | 644 | 80 |
| 81 | 6493 | 6471 | 64 | 6427 | 65 | 638 | 636 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 6450 | 6428 | 64 |  | 6361 | 6338 | 631 | 629 | 627 | 81－624 | $7 \cdot 621$ | 645 | 669 | 693 | 716 | 740 | 764 | 783 | 817 | 835 |  |
| 83 | 64 | 638 | 6362 | 6339 | 62 | 2 | 627 |  |  | 82.620 |  | 738 | 762 | 8 | 81 | 835 | 859 | 883 | 907 | 931 |  |
| 84 | 63 | 63 | 6318 | 6295 | 62 | 62 | 62 | 620 | 6180 |  |  | 832 | 856 | 88 |  | 929 | 933 |  | ．02 | 026 |  |
| 85 | 6320 | 6297 |  |  |  |  |  |  |  | 110 | 7.9007 | 9254 | 950 | 9746 | 999 | －23 | 04 | 073 | 09 | 26 |  |
| 86 | 627 |  |  |  |  |  |  |  |  |  |  | 1186 | 043 | 06 | 093 | 118 | 143 |  | 192 | 217 |  |
|  | 623 | 621 | 61 | 6163 | 613 | 6115 | 60 | 60 | 598 | 87．5973 |  | 111 | 仡 | ， 5 | 183 | 2070 | 237 |  | － | 313 |  |
|  | 61 | 6166 | 61 | 6119 | 6095 | 60 | 60 | 60 | 599 | $87 \cdot 597$ | $8 \cdot 179$ | 205 | 230 | 256 | 281 | 307 | 332 | 35 | 383 | 438 |  |
|  | ， | 612 |  | 6074 | 665 | 6026 | 咗 | 5973 | 5952 | ．5927 |  | 298 | 324 | 493 | 375 | 401 | 427 | 453 | 478 | 504 | 89 |
| 90 | 610 | 607 | 605 | 6030 | 6006 | 5981 | 5956 | 5932 | 5907 | 89.588 | 8.365 | 391 | 417 | 443 | 46 | 9958 | 521 | 547 | 574 | 600 | 90 |
| 91 | 60 | 603 | 6011 | 5986 | 5961 | 5936 | 591 | 5886 | 5861 |  |  | 484 | 51 | 537 | 5 | 告 |  |  |  |  |  |
|  | 601 | 598 | 597 |  | 5917 | 5892 |  | 5841 | 5816 | 91.57 | $8 \cdot 55$ | 578 | 60 | 63 | 658 | 6846 |  | 73 | 764 | 791 | 92 |
| 93 | 597 | 59 | 592 |  | 5873 | 5847 | 5822 | 575 | 5715 | 92.57 |  | 6713 | 6982 | 251 | 752 | 779 | 050 | 83 | 859 | 886 | 93 |
|  | 593 | 5905 | 5880 | 5854 | 288 | 5802 | 57 | 575 | 5725 | $93 \cdot 569$ | 8.7373 | 7645 | 791 | 819 | 8462 | 8734 | 900 | 927 | 955 | 982 |  |
| 95 | 588 | 5862 |  | 5810 | 5784 | 5758 | 5732 |  |  | 65 | 302 | 857 | 8853 | 9128 | 940 | 967 | 995 | ${ }^{+22}$ | 050 | 077 |  |
| 96 | 584 | 577 | 5792 |  |  |  |  |  |  |  |  | 9510 | 9788 |  | 034 | 062 | 0900 |  | 145 | 173 | 96 |
| 97 | 580 | 5773 | 5748 | 572 | 560 | 56 | 56 | 5615 | 5588 | 96556 | －1091 | 0442 | 165 | 100 | 1285 | 1566 | 847 | 2128 | 2409 | 268 | 97 |
|  | 5757 | 573 | 04 | 5678 | 5651 | 562 | 559 | 70 | 5543 | 97．551 | 9．109 | 1375 | 165 | 194 | 2226 | 2510 | 279 |  | 336 | 3645 | 98 |
|  | 5671 |  | 5617 |  | 5606 | 559 | 5552 | 5525 | 5497 | 98.5470 | 9．2020 | 2307 | 2594 | 2881 | 3167 | 3454 | 374 | 402 | 4314 | 4601 | 99 |
| 100 | 5671 | 5644 | 5617 | 5589 | 5562 | 5535 | 5507 | 5480 | 5452 | 99.542 | －2950 | 3240 | 3529 | 3819 | 4108 | 4398 | 4688 | 4977 | 526 | 5556 | 100 |
|  | $40^{\prime}$ | 39 | 38 | 37 | 36 | 35 | $3{ }^{\prime}$ | 33 | 32 | $31^{\prime}$ | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | $37^{\prime}$ | $36^{\prime}$ | $35^{\prime}$ | $34^{\prime}$ | $33^{\prime}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES

| 5 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $5^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | 34 | 35＇ | 36＇ | $37^{\prime}$ | $38^{\prime}$ | $39^{\prime}$ | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | $34^{\prime}$ | $35^{\prime}$ | 36 | 37＇ |  |  |  |
|  | 995 | 9954 | 9953 | 9953 | 9953 | 9953 | 9952 | 9952 | 9952 | 95 | 崖 | 0961 | 0964 | 0967 | 0970 | 0973 | 097 | 0979 | 0982 |  |  |
|  | 9908 | 99 | 9907 | 9906 | 99 | 998 | 99 |  | 9903 | 1.9903 | 19 | 19 | 1928 | 1934 | 1940 | 1946 | 195 | 1957 | 1963 |  |  |
|  | 9862 | 986 | 98 | 9859 | 9859 | 9858 | 9857 |  | 9855 | ． 985 | 2875 | 28 | 2893 | 2901 | 2910 | 2919 | 2927 | 36 | 294 | 29 |  |
|  | 881 | 981 | 9814 | 9812 | 9811 | 9810 | 9809 | 98 | 9807 |  | 834 | 3845 | 38 | 3869 | 38 | 38 | 3903 | 3915 | 392 |  |  |
|  | 9770 | 9768 | 9767 | 9766 | 9764 | 9763 | 9761 | 97 | 9759 | 4.9757 | 4792 | 4807 | 482 | 483 | 485 | 4865 | 4879 | 4894 | 490 | 49 |  |
|  | 9724 | ｜9722 | 9720 | 97 | 9717 | 9715 | 9714 | 9712 | 9710 | 5.9709 | 5751 | 576 | 5785 | 580 | 582 | 5838 | 585 | 587 | 5890 | 5907 |  |
|  | 96 |  |  |  | 70 | 868 |  |  |  |  | 67 |  | 6750 | 677 | 679 | 68 | 6831 | 685 | 687 | 68 |  |
|  | 963 | 9629 | 27 | 9625 | 103787 | 962 | 9618 |  | 961 |  |  |  | 77 | 7737 | 7760 | 7783 | 781 | 7830 | 7853 |  |  |
|  |  |  |  |  |  | 9573 | 9570 |  |  |  |  | 86 | 8678 | 870 | 8730 | 8756 | 878 | 880 | 883 | 886 |  |
| 10 | 9540 | 9537 |  |  |  |  |  |  |  |  |  |  | 9642 | 967 | 9700 | 9729 | 75 | 9787 | 985 | 8845 | 10 |
| 11 | 949 | 9491 | 9487 | 9484 |  | 9478 |  | 9472 | 9469 | 10 | ． 0543 | 057 | 060 |  |  | 0702 |  |  |  |  |  |
| 12 | 944 | 9444 |  | 943 | 94 | 943 | 94 | 942 | 9420 | 11.9 | 1501 | 153 | 157 | 160 |  | 1675 | 1710 | 1745 | 177 | 181 | 12 |
| 13 | 940 |  |  | 9391 | 8 | 9336 | 9380 | 9376 |  | 12. | －2460 | 24 | 253 | 2573 | 2611 | 26 | 2686 | 272 | 276 | 27 | 13 |
| 14 | 935 | 9352 | 9348 | 9344 | 9340 | 933 | 9332 | 9328 | 324 | 13 |  |  | 34 | 354 | 3581 |  | 3662 | 3702 | 37 | 37 | 14 |
| 15 | 93 |  |  | 9297 | 9293 | 9288 | 84 | 9280 | 927 | 14.927 | $1 \cdot 4377$ | 4420 | 44 | 450 | 45 | 459 | 463 | 468 | 472 | 476 | 15 |
| 16 | 9263 | 9259 | 9254 | 9250 | 92 | 9241 | 9236 | 9232 | 9227 | 15 | － 5335 | 5382 | 542 | 547 | 55 | 5567 | 5613 | 5660 | 570 | 5752 | 16 |
| 17 | 921 |  |  |  |  | 913 |  |  |  |  |  |  | 6392 |  | 6491 | 6540 |  | 6638 | 66 |  | 17 |
| 18 | 917 | 66 | 9161 | 91 | 91 | 914 | 91 | 913 | 9131 | 17 | 72 | 7304 | 73 | 7409 | 7461 | 7513 |  | 7617 | 7669 | 772 | 18 |
| 19 | 9125 |  |  |  | 9104 | 9099 | 9093 | 9088 |  | 18 | 砣 |  | 8321 | 8376 | 8431 | 848 |  | 859 | 865 | 870 | 19 |
| 20 | 907 | 9074 |  | 9062 |  | 9051 |  | 9040 |  | $19 \cdot 9028$ |  | 922 |  | 3 | 9401 | － | 951 | 957 | 963 |  | 20 |
| 21 | 90 | 9027 | 9021 | 9016 | 9010 | 9004 |  |  |  | $20 \cdot 8980$ | ． 0128 | 018 | 024 | 31 | 0371 |  | 0492 |  |  |  | 21 |
| 22 | 89 |  | 8975 |  | 8962 | 89 |  | 8944 | 8938 |  | ． 108 | 1 | 1 | 127 | 13 |  | 1468 | 1532 |  |  | 22 |
| 23 | 89 |  |  |  |  | 89 | 8902 | 析 | 8889 | 22.888 | 204 | 21 | 21 | 22 | 23 |  |  | 2511 | 25 |  | 23 |
| 24 | 889 | 8888 | 8882 | 887 | 68 | 886 | 8855 | 48 | 8841 | 23 | 2.300 | 30 | 3142 | 32 | 32 | 3350 |  | 348 | 355 |  | 24 |
| 25 | 88 | 8842 | 8835 | 88 | 8821 | 8814 | 8807 |  | 8793 | 24.8785 | 2.3961 | 403 | 410 | 4179 | 425 | 432 | 439 | 446 | 454 | 4613 | 25 |
| 26 | 88 | 8796 |  | 8781 |  |  |  | 8752 | 8744 | 25.8737 | 2.4920 | 4995 | 5070 | 51.6 | 5221 | 52 | 5372 | 5447 | 5522 | 5597 | 26 |
| 27 | 87 |  |  |  |  |  |  | 8704 |  | $26 \cdot 868$ |  |  | 6035 |  | 6191 |  |  | 426 |  |  | 27 |
| 28 | 87 | 8703 | 8695 | 8687 | 868 | 86 | 8664 | 8656 | 8648 | 27 | ．683 | 69 | 699 | 708 | 71 | 72 | 732 | 7404 | 748 | 756 | 28 |
| 29 |  |  |  |  |  |  |  | 8608 |  | $28 \cdot 859$ | 793 |  |  | 8047 | 8131 | 82 | 8299 | 8383 | 846 |  | 29 |
| 30 | 8619 | 86 | 8602 | 8594 |  | 857 |  | 8560 | 8551 | $29 \cdot 8543$ | 2.8754 |  | 8927 | 9014 |  | 9188 | 9275 | 362 | 9449 | 9535 | 30 |
| 31 | 857 | 8564 | 8555 | 8547 | 8538 | 8529 | 8520 | 8512 | 8503 | 30．849 | ． 9712 |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 85 | 8518 | 8509 | 8500 |  | 848 | 8473 | 8464 | 845 | 31 |  | 07 |  | 094 |  | 113 |  | 1319 | 141 |  | 32 |
|  | 848 |  | 析 | 8453 |  | 84 |  | 矿 |  | 32 | $3 \cdot 162$ |  |  | 191 | 2011 | 2107 | 2202 | 2298 | 2393 |  | 33 |
| 34 | 843 | 84 | 8416 | 8406 | 839 | 83 | 8377 |  | 835 | 33 | 3.258 | 26 | 27 | 28 | 29 | 30 | 31 | 327 | 337 |  | 34 |
| 35 | 83 | 8379 | 8369 | 8359 |  | 8339 | 8330 | 83 | 83 | 34．8300 | 3.3546 | 36 | 37 | 385 | 39 | 40 | 415 | 425 | 435 | 4458 | 35 |
| 36 | 8343 | 8333 |  | 8312 |  |  |  | 827 | 8261 | 35.825 | 3.4504 | 4609 | 4713 | 4817 | 4921 | 5026 | 5130 | 5234 | 5338 | 5443 | 36 |
| 37 | 829 | 828 |  | 8266 |  | 8245 |  | 8224 | 8213 | $36 \cdot 820$ |  |  | 567 |  |  |  |  | 6213 |  |  | 37 |
| 38 | 825 | 8240 |  | 8219 |  | 8197 |  | 8176 | 8165 | $37 \cdot 815$ |  | 65 | 66 | 67 |  |  |  | 713 | 73 |  | 38 |
| 39 | 82 |  |  | 8172 |  |  |  | 8128 |  |  |  |  | 7606 | 771 |  |  | 805 | 8170 | 82 |  | 39 |
| 40 | 815 | 8147 |  | 8125 |  |  |  | 8080 |  |  | 3.8338 | 8454 | 8570 | 8686 | 8802 | 8917 | 9033 | 9149 | 926 | 381 | 40 |
| 41 | 811 | 81 |  | 8078 |  | 8055 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 806 |  |  |  |  | 80 |  |  |  |  |  |  |  | 062 |  |  |  |  |  |  | 42 |
|  | 80 |  |  |  |  | 7960 |  | 7936 | 7923 | 42791 | $4 \cdot 12$ |  |  |  | 1712 | 183 |  | 2085 | 2210 |  | 43 |
| 44 | 797 | 79 |  |  |  | 79 |  | 7888 |  |  | 4.21 |  |  | 255 |  |  | 293 | 206 | 319 |  | 44 |
| 45 | 792 | 79 | 7903 | 7890 |  | 783 | 7852 |  | 782 |  | 4 |  |  | 352 |  | 37 | 391 | 404 | 417 | 430 | 45 |
| 46 | 7882 | 7869 | 7857 | 7844 | 7831 | 7818 |  |  | 7778 | $45 \cdot 776$ |  | 4222 |  | 4489 |  |  |  |  | 5154 |  | 46 |
| 47 | 783 | 7823 | 7810 | 7797 | 7783 | 77 |  |  | 7730 |  |  |  |  | 545 |  |  |  |  |  |  | 47 |
| 48 | 779 | 77 | 7763 | 7750 |  | 77 |  |  | 7682 |  |  |  | 62 | 64 | 65 |  |  |  |  |  | 48 |
| 49 | 77 |  |  |  |  |  |  | 7648 |  |  |  |  | 72 |  | 75 |  |  | 7957 | 8099 |  | 49 |
| 50 | 768 | 768 | 7670 | 7656 | 7642 | 7628 | 7614 | 7600 | 7585 | 49.757 | 47923 | 8068 | 8212 | 8357 | 8502 | 864 | 879 | 8936 | 981 | 22 | 50 |
| 51 | 765 | 763 | 762 | 760 |  | 758 |  |  |  | 50752 |  |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 760 |  |  |  |  |  |  |  |  | 51 |  |  |  |  |  |  |  |  |  |  | 52 |
| 53 | 756 |  |  |  |  | 7486 |  | 7455 | 7440 | $52 \cdot 74$ | 5.079 |  |  | 125 | 14 | 15 |  | 1872 | 2026 |  | 53 |
| 54 | 751 | 749 | 7484 |  |  | 7438 |  |  |  | 53 | $5 \cdot 17$ | 19 |  | 222 | 23 | 253 | 26 | 285 | 300 | 有 | 54 |
| 55 | 7468 | 745 | 7437 | 7422 |  | 739 |  |  |  | 54.7328 | $5 \cdot 27$ | 28 | 30 | 3193 |  | 35 | 367 | 383 | 398 |  | 55 |
| 56 | 7422 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 56 |
|  | 73 | 736 |  |  |  | 7296 |  | 7263 |  | 56.723 | 5.463 |  |  |  |  |  |  |  | 595 |  |  |
| 58 | 733 | 7314 | 7297 | 7281 |  | 72 |  | 7215 | 719 | 57．718 | 5.559 | 57 |  | 60 | 62 | 643 |  | 67 | 6936 |  | 58 |
| 59 |  |  |  |  |  |  |  |  | 715 |  | 65 |  |  |  |  |  |  | 776 | 916 |  | 59 |
| 60 | 7238 | 7221 | 7204 | 7187 | 7170 | 7153 | 7136 | 7119 | 7102 | 59．7085 | $5 \cdot 7507$ |  | 7855 | 802 | 8202 | 837 | 8550 | 8723 | 889 | 907 | 60 |
| － | 7192 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 61 |
| 62 | 714 | 71 |  |  |  |  |  |  |  | $61 \cdot 698$ | ， |  |  |  |  |  |  |  |  |  | 62 |
| 63 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 63 |
| 64 | 7054 | 70 |  | 7000 |  |  |  | 692 | 69 | 63.689 | 13 |  | 17 | 189 | 208 | 22 | 24 | 26 | 282 |  | 6 |
| 65 | 7008 | 69 |  | 6953 |  |  |  |  |  | 64.684 | 230 | 248 | 2676 | 286 |  | 32 | 342 | 361 |  |  | 65 |
| 66 | 696 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 67 |
| 68 | 686 | 6850 |  | 681 | 6793 | 67 | 6755 | 6735 | 6716 | 67 | $6 \cdot 517$ | 53 |  | 57 |  | 616 | 63 |  |  |  | 68 |
| 69 |  |  |  |  |  |  |  |  |  |  |  |  | 6533 |  |  |  |  |  |  |  | 69 |
| 70 | 6777 | 6758 | 6738 | 6719 | 6699 | 6679 | 6659 | 6639 | 661 | 69.659 | 6. | 729 | 749 | 770 | 790 | 810 | 830 | 851 | 87 | 891 | 70 |
|  | 673 |  |  | 667 | 665 | 663 |  |  | 657 | 70.655 | 6.8051 |  |  | 8667 |  |  | 928 | 9489 |  |  | 71 |
| 7 | 668 |  |  | 667 |  |  |  |  | 6523 | 725 | 909 | 92 | 942 | 963 | 9843 |  |  |  |  |  | 72 |
|  | 685 |  |  | 6578 |  |  | 6516 |  |  |  |  |  |  |  | 0813 |  |  |  |  |  | 73 |
| 7 | 6593 | 657 | 655 | 6531 | 65 | 648 | 64 | 6447 | 6426 | 73. | 7.092 | 11 | 135 |  | 178 |  | 22 | 242 | 2640 | 28 | 74 |
| 75 | 654 |  |  |  |  |  |  |  |  |  | 88 | 210 | 2319 | 253 | 275 | 2970 | ${ }^{1}$ | 4 |  | 38 | 75 |
| 76 | 650 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
| 77 | 645 | 638 |  | 6390 | 6369 | 63 | 6325 | 6303 | 6281 | 62 | 7.3801 | 402 | 4247 | 44 | 469 | 49 | 51 | 5362 | S |  | 77 |
| 78 | 640 | 638 | 6365 | 6344 | 63 | 629 | 6277 | 6255 | 623 | $77 \cdot 621$ | 476 | 4986 | 5211 | 54 | 566 | 58 | 611 | 634 | 65 | 679 | 78 |
| 79 |  |  |  |  |  |  | 仡 |  |  | 78.6162 |  |  | 6176 |  | 6633 |  |  | 319 |  |  |  |
|  | 6317 | 6295 | 6272 | 6250 | 6227 | 6205 | 6182 | 6159 | 6136 | 79．611 | －667 | 6908 | 7140 | 337 | 76 | 783 | 806 | 829 | 853 | 87 | 80 |
| 81 | 627 | 6248 | 6226 | 620 | 618 | ， | 6134 | 6111 | 608 | $80 \cdot 606$ | $7 \cdot 763$ | 7870 | 8104 | 83 | 85 | 88 | 042 | 927 | 911 |  | 81 |
| 82 | 622 | 6202 | 6179 | 6156 | 6133 | 6110 | 6086 | 6063 | 604 | $81 \cdot 601$ | 859 | 883 | 9068 | 930 | 954 | 97 | － 01 | 025 | 049 |  | 82 |
| 83 | 6173 |  | 6083 | 6 | 6086 | 60 | 6039 |  | 5983 |  | $7 \cdot 955$ |  |  |  | 14 | 17 |  | 23 | 147 |  | 83 |
| 84 | 6133 | 610 | 60 | 606 | 6039 | 60 | 5991 | 5967 | 59 | 83.591 | 8.05 | 0754 | 0997 | 124 | 148 | 17 | 197 | 2213 | 24 | 26 | 84 |
| 85 | 6087 |  |  |  |  | 5967 |  |  | 5895 | 84.587 | $8 \cdot 1469$ | 1715 | 96 | 2207 | 2453 | 269 | 294 | 319 | 3438 |  | 85 |
| 86 | 641 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 86 |
| 87 | 5995 | 59 | 5946 | 5922 | 5897 | 5872 | 5848 | 5823 | 579 | 86573 | 8.3386 | d |  | ， | 4393 | 4645 | 489 | 5149 | 540 | 565 | 87 |
| 88 | 59 | 59 | 5899 | 58 | 50 | 325 | 800 | 5775 | 5750 | 87.572 | 8434 | 45 | 4854 | 510 | 536 | 56 | 58 | 6128 | 638 | 663 | 88 |
| 89 | 3 |  | 5853 | 5828 | 5750 | 573 | 5752 | 星 | 5702 | 567 |  | 550 | 5818 |  | 633 | 659 | 684 | 108 | 536 |  | 89 |
| 90 | 5857 | 831 | 5806 | 5781 | 5756 | 5730 | 5705 | 5679 | 5654 | 89.5628 | 626 | 6522 | 6782 | 04 | 730 | 7564 | 782 | 808 | 834 | 86 | 90 |
| 91 | 581 |  | 5760 | 5734 |  | 5683 | 5657 | 5631 | 560 | 55 | 8.7220 | 7483 | 7747 | 801 | 827 | 85 | 8800 | 906 | 932 |  | 91 |
| 92 | 5765 |  | 571 | 5687 | 5601 | 5635 | 569 | 5583 | 555 | 91531 |  |  | 871 | 897 | 24 | 9510 | 年 | 043 |  |  | 92 |
| 9 | 5718 | 56 | 5666 | 56 | 56 | 5588 | 55 | 5535 | 550 | 92.548 | 8913 | 940 | 967 | 994 | ＋214 | 0483 | 0752 | 1021 | 129 |  | 93 |
| 94 | 5672 | 56 | 5620 | 5593 | 5567 | 5540 | 14 | 5487 | 5460 | 93.543 | 9.009 | 0367 | 063 | 091 | 118 | 145 | 172 | 200 | 227 | 25 | 94 |
| 95 | 56 |  |  |  |  |  |  |  | 5412 | 94＇5385 | 9．1054 |  |  | 1879 | 2154 | 2429 | 2704 | 2979 | 3254 |  | 95 |
|  | 5580 |  | 527 | 500 |  |  |  | 539 | 5 |  |  |  |  |  |  |  | 680 | 矿 | 23 |  | 96 |
|  | 55 | 55 | 5480 | 545 | 5425 |  | 5 | 5343 | 53 | ， | 9.2970 | 32 | S | 3813 | ， | 43 | 4655 | 493 | 52 | 549 | 97 |
| 98 | 5488 |  | 5433 | 5 |  | 5351 | 5323 | 5295 | 5267 |  | 9.3929 | 4213 |  | 478 |  | 5348 | 563 | 591 | 190 |  | 98 |
|  | 5442 |  |  |  |  |  | 5275 | 5247 | 5219 | 98．519 | 48 | 5174 | 546 | 5747 | 603 | 6320 | 6607 | 689 | ， |  | 99 |
| 100 | 5396 | 5368 | 5340 | 5312 | 5284 | 5256 | 5227 | 5199 | 5171 | $99^{\cdot 5142}$ | 9．5846 | 6135 | 6425 | 6714 | 7004 | 7293 | 7583 | 7872 | 8162 | 8451 | 100 |
|  | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | $26^{\prime}$ | 25 | $24^{\prime}$ | $23^{\prime}$ | $22^{\prime}$ | 21 | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | $26^{\prime}$ | 25 | $24^{\prime}$ | $23^{\prime}$ |  | $21^{1}$ |  |
| 84 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 84 |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

| Cosine． |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $6^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | $1{ }^{\prime}$ | $2^{\prime}$ | $3^{\prime}$ | $4^{\prime}$ | ［5＇ | $6^{\prime}$ |  | $8^{\prime}$ |  | $0^{\prime}$ | $1^{\prime}$ | 2 | 3 | $4^{\prime}$ | $5{ }^{\prime}$ | 6 | $7^{\prime}$ | $8{ }^{\prime}$ | $9^{\prime}$ |  |
|  | 994 | 994 | 994 | 9944 | 9944 | 9944 | 9943 | 9943 | 9943 |  | 104 | 1048 | 1051 | 1054 | 1057 | 106 | 1063 | 1066 | 1068 | 07 |  |
|  | 9890 | 9890 | 9889 | 988 | 988 | 9887 | 9887 | 9886 |  | 1.9885 | 2091 | 2096 | 2102 | 210 | 211 | 2119 | 2125 | 2131 | 2137 | 143 |  |
|  | 983 | 9835 | 9834 | 9833 | 983 | 9831 | 9830 | 9829 | 982 | 2.982 | 3136 | 3145 | 3153 | 316 | 31 | 3179 | 3188 | 3197 | 3205 | 321 |  |
|  | 9781 | 9780 | 978 | 977 | 9776 | 9775 | 971 | 9772 | 977 | 3.977 | 18 | 4193 | 4204 | 4216 | 422 | 4239 | 425 | 4262 | 4274 | 428 |  |
|  | 9726 | 9725 |  |  | 97 | 9718 |  | 9715 |  |  | 5226 | 524 | 5 | 52 | 528 | 529 | 5313 | 5328 | 5342 | 5357 |  |
|  | 967 | 9669 | 9668 | 9666 | 9664 | 9662 | 9660 | 9658 | 9657 | 5.9655 | 6272 | 6289 | 6306 | 6324 | 634 | 6358 | 6376 |  | 6411 |  |  |
|  | 9617 | 961 | 961 | 9610 | 96 | 9606 | 9604 | 96 | 95 | 5 | 731 | 73 | 73 | 73 | 739 | 74 | 74 |  | 7479 |  |  |
|  | 9562 | 95 |  |  | 9552 | 95 |  | 45 | 95 | 7.95 |  | 8385 | 840 | 8432 | 845 | 8478 | 8501 | 8524 | 8547 | 857 |  |
|  | 950 | 950 | 01 | 9499 | 9496 | 9493 | 9490 | 94 | 9485 | 8.948 | 408 | 9434 | 9460 | 94 | 95 | 953 | 956 | 90 | 961 | 964 |  |
| 10 | 945 | 9449 | 9446 | 9443 | 9440 | 9437 | 9434 | 9431 | 9428 | 9.9424 | 53 | 0482 | 0511 | 0540 | 0569 | 059 | 062 | 065 | 068 | 0713 | 0 |
| 11 | 93 | 93 | 939 |  |  |  |  | 937 | 93 |  | 1.1498 | 1530 | 1562 | 1594 | 1625 | 16 | 1689 | 1721 | 1753 | 1784 | 11 |
|  | 934 | 93 | 9335 | 9332 | 9328 |  |  | 931 | 9313 | 11.9 | 2543 |  | 2613 | 2648 | 268 | 271 | 275 | 86 | 282J |  | 12 |
| 13 | 928 | 9284 | 928 | 92 | 92 | 9268 |  | 92 | 925 | 12.925 | 35 | 36 | 36 | 37 | 3739 | 377 | 3814 | 3852 | 3890 |  | 13 |
|  | 9233 | 922 | 25 | 92 | 92 | 9212 | 9207 | 9203 | 9199 | 13.919 | 463 | 46 | 47 | 475 | 479 | 483 | 4877 | 4917 | 4958 | 499 | 14 |
| 15 | 9178 | 9174 |  | 9165 | 9160 | 9155 | 9151 | 46 | 41 | 14.9137 | － 5679 | 5723 | 57 | 5809 | 585 | 589 | 5940 | 5983 | 6026 | 607 | 15 |
| 16 | 912 | 91 | 9114 | 9109 | 9104 | 9099 | 9094 | 9089 | 084 | 15.90 | $1 \cdot 6725$ | 6771 | 6817 | 6863 | 6910 | 6956 | 7002 | 7049 |  |  | 16 |
|  | 906 | 90 | 9058 | 9053 | 9048 | 9043 | 9037 | 9032 | 90 | 16.90 | $\cdot 7770$ | 78 | 7868 | 79 | 7967 | 80 | 80 | 14 | 8163 | 821 | 17 |
|  | 901 | 900 | 9003 | 8997 | 8992 | 8986 | 8981 | 8975 | 89 | 17.89 | 8815 | 88 | 89 | 897 | 902 | 907 | 912 |  | 9232 | 928 | 18 |
|  | 895 | 89 | 8948 | 8942 | 893 | 8930 | 8924 | 8918 | 89 | 18.8 | －9860 | 9915 | 9970 | ${ }^{1}$ | 00 | 013 | 019 | 024 | 0300 |  |  |
| 20 | 89 | 8898 | 92 | 8886 | 8880 | 8874 | 68 | 8861 | 55 | 198 | $2 \cdot 0906$ | 0964 | 102 | 1079 | 1137 | 119 | 125 | 13 | 1369 | 142 | 20 |
| 21 | 8850 | 8843 |  |  |  |  |  |  |  |  | $2 \cdot 195$ |  | 20 | 213 | 219 | 225 | 23 | 2376 | 24 | 249 |  |
| 22 | 87 | 87 | 8781 | 8775 |  |  | 8754 | 8748 | 87 | 21.87 |  |  | 31 |  | 325 | 3314 | 33 |  | 3505 | 356 |  |
| 23 | 87 | 87 | 8726 | 871 | 87 | 87 | 8698 | 8691 | 86 | $22 \cdot 86$ | 40 | 410 | 417 | 42 | 43 | 43 | 4441 | 4507 | 45 | 464 |  |
|  | 868 |  | 86 | 866 |  |  |  | 8634 | 8626 | 23.8619 | 50 | 515 | 52 | 529 | 53 | 54 |  |  | 56 | 57 |  |
| 25 | 863 | 8623 | 15 | 8608 | 86 | 859 | 85 | 8577 | 569 | 24.856 |  |  |  | 6340 | 64 |  |  |  |  | 678 |  |
| 26 | 8576 | 8568 | 8560 | 8552 | 8544 | 8536 | 8528 | 8520 | 8512 | 25 | 27177 | 7253 | 7328 | 7403 | 7478 | 7553 | 762 |  |  |  |  |
| 27 | 85 |  |  | 8496 |  |  |  | 8463 |  | $26 \cdot 84$ | $2 \cdot 822$ |  |  | 845 | 853 | 8613 | 8691 |  | 884 | 892 |  |
| 2 | 846 | 84 |  | 8440 |  | 8423 |  | 8406 | 839 | 27－83 | 268 |  |  | 9511 | 959 | 9673 | 9754 | 9835 | 991 |  |  |
| 2 | 84 | 84 | 8394 | 8385 | 837 | 836 | 835 | 8349 | 834 | 28 | 3.0313 | 03 | 0481 | 0565 | 06 | 0733 | 0817 | 0900 | 0984 |  |  |
| 30 | 8357 | 8347 | 8338 | 8329 | 8320 | 8311 | 8301 | 8292 | 8283 | $29 \cdot 827$ | 135 | 14 | 15 | 16 | 170 | 179 | 18 | 19 | 205 | 214 |  |
| 31 | 83 | 82 |  | 827 |  |  |  |  |  | 30．821 | 3.240 |  |  | 267 | 276 | 285 | 2942 | 3032 | 3121 | 321 |  |
| 32 | 824 | 823 | 822 | 82 | 82 |  |  |  | 816 | 31 | 3.34 |  |  | 3727 | 381 |  |  |  | 4190 | 428 |  |
| 33 | 8192 | 81 |  | 8162 | 8152 | 8142 |  | 8121 | 8111 | 32 | 3.4494 | 459 | 4685 | 4781 | 48 | 49 | 50 | 5163 | 525 | 53 |  |
| 3 | 813 | 81 |  | 1 | ， |  |  | de64 | 8054 |  |  |  |  | 5835 | 593 |  | 61 | 6228 | 632 | 64 |  |
| 35 | 808 | 8072 | 8061 | 8051 | 8040 | 8029 | 8018 | 007 | 7997 | 34 |  |  |  |  |  |  |  |  |  |  |  |
| 36 | 8028 | 8017 | 8006 | 7995 | 7984 | 7973 | 7962 | 7951 | 7939 | 35.7928 | 3.7630 | 7734 | 7839 | 7943 | 804 | 8151 | 8255 |  |  |  |  |
| 37 |  |  |  | 7939 | 7928 |  |  |  | 7882 | 36.7 |  |  |  |  |  |  |  |  | 953 |  |  |
| 38 | 79 |  |  | 7884 | 7872 |  |  | 7837 | 782 | 37 | 3.97 |  |  |  | 016 | 02 |  |  |  |  |  |
| 39 | 78 | 78 |  | 7828 | 7816 |  |  |  | 776 | 38 | 4.07 |  |  | 1105 | 121 | 13 | 1443 | 155 | 166 |  |  |
| 40 | 7809 | 7797 | 7784 | 7772 | 7760 | 7748 | 7735 | 7723 | 10 | 39.7698 | 4.1811 | 19 | 2043 | 215 | 227 | 239 | 25 | 262 | 273 | 285 |  |
| 41 | 775 | 774 |  | 7716 | 7704 |  | 7679 |  | 7653 | $40^{\circ}$ | 4.285 | 297 |  |  |  |  |  |  |  |  |  |
| 42 | 769 | 768 |  |  |  |  |  |  | 759 | $41 \cdot 7$ | 4 ＇39 | 40 | 4145 | 426 | 43 |  |  |  |  |  |  |
| 43 | 7644 | 7631 | 7618 | 7605 | 7592 | 75 |  | 7552 | 7539 | 427 | $4 \cdot 49$ |  |  | 53 | 54 | 5569 | 5694 | 5818 | 594 | 6067 |  |
| 44 | 75 | 757 |  |  | 7536 | 7522 |  | 7495 | 748 | 43 |  | 612 | 62 | 637 | 650 |  | 6756 | 6883 | 7011 |  |  |
| 45 | 753 | 752 |  |  |  | 7466 |  | 7438 | 7424 | 44.7 | 47038 |  |  | 742 | 755 |  |  |  | 8079 |  |  |
| 46 | 7480 | 7466 |  |  |  | 7410 |  |  |  |  |  | 8216 |  | 848 | 86 | 87 | 8881 |  | 148 |  |  |
| 47 | 析 | 7411 |  | 7382 |  | 7353 |  |  | 7310 | $46 \cdot 72$ | 4.912 |  |  |  |  |  |  |  |  |  |  |
| 48 | 737 | 73 | 1341 | 7327 | 7312 | 7297 |  |  | 7252 | $47^{\circ}$ | 5.01 | 0313 | 0451 | 059 | 072 |  |  |  |  |  |  |
| 49 | 73 |  | 7286 | 7271 | 7256 |  |  | 7210 | 7195 | 48. | $5 \cdot 12$ |  |  | 164 | 178 |  |  | 22 | 235 |  |  |
| 50 | 7261 | 7246 | 7230 | 7215 | 7200 | 7184 |  | 7154 | 7138 | 49 | 5.2264 | 2409 | 2554 | 269 | 28 | 29 | 313 | 3277 | 342 |  |  |
| 51 | 7206 | 719 | 717 | 59 | 7144 |  |  |  |  | 50 | 5.33 |  |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  |  |  |  |  |  | 70 | 51700 |  | 45 | 465 | 48 | 495 | 510 |  | 540 |  |  |  |
| 53 | 7097 |  |  | 7048 | 7032 | 7015 |  | 6983 | 6966 | 52．695 | 5.54 |  | 570 |  | 60 | 616 |  | 647 | 6627 |  |  |
| 54 | 704 | 702 |  |  | 697 |  |  | 6926 |  |  | 5.6445 | 660 | 6758 | 691 | 707 |  |  | 7539 |  |  |  |
| 55 | 6987 | 6970 |  |  |  |  |  |  |  |  | $5 \cdot 749$ |  | 7809 | 7 | 812 |  | 8445 | 8604 | 8763 | 8922 |  |
| 56 | 6932 | 6915 | 6898 | 688 | 6864 |  |  |  |  |  |  |  |  |  |  |  |  |  | 93 |  |  |
|  | 68 | 68 | 6843 | 6825 | 6808 |  |  |  | 6737 | 56 | $5 \cdot 958$ |  |  |  | 024 |  |  |  | 90 |  |  |
| 58 | 687 |  |  |  | 67 |  |  | 6698 | 6680 | $57 \cdot 6$ | ． 06 |  | 09 | 113 | 129 | 14 | 163 | 180 | 196 |  |  |
| 59 |  |  |  |  |  |  |  | 6641 | 6623 |  |  |  | 2013 | 218 | 235 | 25 | 26 | 286 | 303 |  |  |
| 60 | 6713 | 66 | 6677 | 6658 | 6640 | 6621 | 6603 | 584 | 6566 | 59．654 | 6.2717 | 289 | 3064 | 3238 | 3411 | 3585 | 3758 | 393 | 410 | 4279 |  |
| 61 | 665 |  |  |  |  |  | 6546 | 65 | 6508 | $60^{\circ}$ | 6.37 |  |  |  |  |  |  |  |  |  |  |
| 62 |  |  |  |  | 65 |  |  | 6470 | 64 |  |  |  |  |  | 55 |  |  | 608 | 6242 | 642 |  |
| 63 | 654 | 65 | 65 | 649 | 6472 |  |  | 613 |  | ． 63 |  |  |  |  | 658 |  |  |  | 矿 |  |  |
|  | 64 | 64 |  | 64 | 643 |  |  | 63 | 633 | 63.63 | \％898 |  | 238 | 745 | 763 | 78 | 8009 | 8194 | 837 |  |  |
| 65 |  | 64 |  |  |  |  |  |  |  |  | $6 \cdot 7944$ |  | 832 | 850 |  |  |  |  | 9448 |  |  |
| 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 633 | 63 |  | 6268 | 62 | 62 |  |  |  | 66 |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 627 | 625 |  | 6213 | 6192 | 6171 |  | 61 | 61 | 67．60 | $7 \cdot 1070$ |  | 14 | 16 | 186 | 206 | 226 | 24 | 265 | 285 |  |
|  |  |  |  |  |  |  |  |  |  | 68. | 7－2125 |  | 232 | 272 | 292 |  |  | 352 | 372 |  |  |
| 70 | 616 | 614 | 6123 | 610 | 6080 | 6058 | 60 | 6015 | 5993 | 69.597 | $7 \cdot 3170$ | 337 | 357 | 377 | 398 | 418 | 438 | 4587 | 479 | 49 |  |
|  | 61 | 60 | 6067 | 6046 | 60 | 6002 | 5980 | 5958 | 5936 | 70 | 7.42 |  | 462 |  |  |  |  |  |  |  |  |
| 72 |  | 60 | 6012 |  | 5968 |  |  | 5901 | 587 | 71.58 | $7 \cdot 5261$ |  | 567 | 588 | 609 | 63 | 65 | 67 | 692 | 713 |  |
|  | 600 | 5979 | 5956 | 5934 | 5912 | 58 | 5867 | 5844 | 582 | 72.579 |  |  |  | 799 |  |  |  |  |  |  |  |
| 74 | 59 | 5924 | 5901 | 5878 | 58 | 58 | 5810 | 57 | 57 | $73 \cdot 5741$ | $7 \cdot 735$ | 75 | 777 | 799 | 820 | 84 | 863 | 8849 | 906 |  |  |
| 75 |  |  |  |  |  |  |  |  |  |  | 7.8396 |  | 8830 | 904 | 92 | 948 | 969 | 99 | －13 | 03 | 75 |
| 76 | 5837 | 5813 |  | 5711 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 200 |  |  |
| 77 | 5782 | 575 | 5735 | 5711 | 568 | 56 | 56 | 5616 | 559 | 76.55 | 048 | 07 | 09 | 115 | 1378 |  | 182 |  |  |  |  |
| 78 | 5727 | 5703 |  | 56 |  |  |  | 5559 | 5535 | $77 \cdot 55$ | $\cdot 15$ | 175 | 1983 | 220 | 243 | 26 | 288 | 3112 | 333 | 356 |  |
| 79 | 5672 | 564 | 5624 | 560 | 557 | 555 | 5527 | 5503 | 5478 | 78.545 |  |  | 3035 | 3263 | 349 | 3720 | 39 | 4177 | 440 | 463 |  |
| 80 | 56 | 5593 | 5569 | 5544 | 5520 | 5495 | 5470 | 5446 | 5421 | 79．539 | 362 | 385 | 408 | 431 | 454 | 478 | 501 | 524 | 547 | 5034 | 80 |
| 81 | 5563 |  | 5513 | 589 | 54 |  | 5414 | 5389 | 5364 | 80.533 | 4 | 4902 | 5137 | 537 | 560 | 58 | 6074 | 630 | 654 |  |  |
|  | 550 | 5481 | 5 | 5372 | 54 |  | 535 | 533 | 5306 |  |  | 59 | 6188 | 642 | 666 | 689 | 713 | 737 | 761 | 78 |  |
| 83 | 5453 | 5428 5373 | 5403 | 5377 | 535 | 532 | 5300 | 5275 | 5249 | 82.522 | ． 67.75 | 699 | 723 | 747 | 771 | 795 | 819 | － | 8674 |  |  |
|  | 5398 | 5313 | 247 | 21 | 296 | 210 | 5244 | 5218 | 5192 | 83.516 | 8.780 | 8047 | 829 | 853 | 877 | 901 | 92 | 95 | 9748 | 999 |  |
| 85 | 534 | 5318 | 5292 | 5266 | 5240 | 521 | 518 | 516 | 513 |  |  |  |  |  | － | ， |  |  | 81 | 1062 | 85 |
| 86 | 528 | 526 | 5236 | 5210 | 5184 | 5157 | 513 | 5104 | 507 |  |  |  | 1 |  | 硣 |  |  |  |  |  |  |
|  | 5234 | 5208 | 5181 | 5154 | 5128 | 5101 | 5074 | 5047 | 5020 | $86^{\circ} 499$ | 09 | 119 | 144 | 169 | 1946 | 2198 | 245 | 2701 | 2953 | 220 |  |
| 88 | 5179 | 51 | 501 | 509 | 50 | S01 | 501 | 4990 | 4963 | 87.493 | 9.198 | 224 | 243 | 274 | 3003 | 3258 | 3512 | 376 | 402 | 42 |  |
| 89 | 512 | 509 | 50 | 504 | 50 | 49 | 496 | 4933 | 4906 | 88.4878 | ．3030 | 328 | 354 | 380 | 4060 | 431 | 4575 | 4832 | 5090 | 534 |  |
| 90 | 50 | 5042 | 5015 | 4987 | 4960 | 4932 | 4904 | 4876 | 484 | 89．4820 | 07 | 433 | 459 | 485 | 5117 | 537 | 563 | 5898 | 6158 | 641 | 90 |
|  | 501 | 4987 |  | 4876 | 4904 | 487 | 401 | 4819 | 4791 | 90 |  | 5384 |  |  | 6174 | 643 | 67 | 696 | 7227 | 49 | 91 |
| 92 | 496 | 4932 | 4904 | 4876 | 4848 | 4819 | 4791 | 4762 | 4734 | 9147 | 9 | 64 | 667 | 6965 | 7231 | 749 | 883 | 802 | 829 | 856 |  |
|  | 4905 | 4877 | 4849 | 4820 | 4792 | 4763 | 4734 | 4706 | 4677 | 92．464 | $9 \cdot 721$ | 748 | 775 | 8019 | 8288 | 855 | 88 | 90 | 93 | 963 | 93 |
|  | 4851 | 482 | 4793 | 4 | ， | 4 | 4678 | 4649 | 4619 | $93 \cdot 4590$ | ． 8257 | 8529 | 8801 | 9073 | 934 | 961 | 9888 | －160 | 043 | 070 | 94 |
| 9 | 4796 | 476 | 4738 | 47 | 4680 | 465 | 4621 | 4592 | 4562 | 94．4533 | 9302 | 57 | 852 | ＋12 | 0401 | 067 |  | 122 | 1500 | 177 | 95 |
| 96 | 4741 | 4712 | 4682 | 4653 | 4624 | 4594 | 4564 | 4535 | 4505 | 95.4475 | 10.0347 | 0625 | 090 | 1180 | 145 | 173 | 201 | 2 |  |  | 96 |
|  | 4686 | 4657 | 4627 | 4597 | 4568 | 4538 | 4508 | 4478 | 4448 | 96．441 | $10 \cdot 1393$ | 1673 | 1954 | 2234 | 2515 | 27 |  | 33 | 3637 |  | 97 |
| 98 | 463 | 450 | 4572 | 4542 | 4512 | 4481 | 445 | 4421 | 4390 | 97．4360 | 10．2438 | 272 | 30 | 3288 | 3572 | 3855 | 413 | 4422 | 578 | 4989 | 98 |
|  | 4577 | 4546 | 4516 | 4486 | 4456 | 4425 | 4395 | 4364 | 4333 | 98．4302 | 10.3483 | 3770 | 405 | 4342 | 4629 | 4915 | 520 | 5488 | 5774 | 6060 |  |
| 100 | 4522 | 449 | 4461 | 4430 | 4400 | 4369 | 4338 | 4307 | 4276 | 99＇4245 | $10^{\circ} 4529$ | 4818 | 5107 | 5396 | 5686 | 5975 | 6264 | 6553 | 6843 | 7132 | 00 |
|  | $60^{\prime}$ | $59^{\prime}$ | $58^{\prime}$ | 57 | $56^{\prime}$ | $55^{\prime}$ | $54^{\prime}$ | $53^{\prime}$ | 521 | $5{ }^{1}$ |  | 59＇ | 58 | $57^{\prime}$ | 56 | ${ }^{5} 5{ }^{\prime}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $6^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $6^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 10， | $11^{\prime}$ | $12^{\prime}$ | $13^{\prime}$ | 14＇ | 15 | 16 | 17 | $18^{\prime}$ | 19 | 10 | $11^{\prime}$ | $12^{\prime}$ | 13 | ＋ | $5^{\prime}$ | $16^{\prime \prime}$ | $17^{\prime} 1$ |  |  |  |
|  | 9942 | 9942 | 9942 | 9941 | 9941 | 9941 | 9940 | 9940 | 9940 | －993 | 107 | 1077 | 1080 | 1083 | 1086 | 108 | 109 | 1094 | 1097 | 100 |  |
| 2 | 9884 | 988 | 988 | 988 | 98 | 981 | 98 |  |  | 987 | 148 | 2154 | 2160 | 2166 | 2172 | 217 | 2183 | 218 |  |  |  |
| 3 | 9826 | 9825 | 9825 | 9824 | 9823 | 98 | 9821 |  | 98 | $2 \cdot 981$ | 3223 | 3231 | 3240 | 32 | 3257 | 3266 | 3275 | 3283 | 3292 |  |  |
| 4 | 976 | 97 | 9766 | ， |  | 62 | 9761 |  | 9758 | 3. | 297 | 4308 | 4320 | 433 | 43 | 435 | 4366 | 4378 | 4389 | 440 |  |
| 5 | 11 | 09 | 9708 | 9706 | 9704 | 9703 | 701 | 9700 | 9698 | 4. | 5371 | 538 | 5400 | 5414 | 5429 | 544 | 5458 | 5472 | 5487 | 550 |  |
| 6 | 9653 | 9651 | 9649 | 9647 | 9645 | 9643 | 96 | 9640 | 9638 | 5.9636 | 6445 | 6463 | 6480 | 6497 | 6515 | 65 | 654 | 656 | 6584 | 660 |  |
| 7 | 9595 |  | 9591 | 95 | 9586 | 9584 | 9582 |  | 937 |  |  |  | 析 | 758 | 76 | 76 | 7641 | 76 | 根 |  |  |
|  | 9537 | 953 | 953 | 953 | 9527 | 952 | 52 | 9519 | 9517 | 7.951 |  |  | 8640 | 8663 | 86 | 8709 | 232 | 875 | 877 | 880 |  |
| 9 | 9479 | 9476 | 9474 | 9471 |  | 9465 | 析 |  | 945 | 8.945 | 668 | 9694 | 9720 | 9746 | 97 | 978 | 9824 | 9850 | 9876 | 902 |  |
| 10 |  |  |  |  |  |  |  |  | 9396 |  |  | 0771 | 0800 | 329 | 085 | 088 | 916 | 94 | 0973 | 100 | 0 |
| 11 | 363 | 936 | 9357 | 9353 | 9350 |  | 9343 | 9339 | 9336 | 10 | ． 1816 | 1848 | 1880 | 1912 | 194 |  |  | 2039 | 2071 |  |  |
| 12 | 930 | 930 | 929 | 929 | 929 | 9 | 9283 | 927 | 927 | 11.92 | 28 | 2925 | 29 | 29 | 302 | 30 |  | 313 | 3168 | 32 | 12 |
| 13 | 924 | 9244 | 9240 | 92 |  |  | 23 | 9219 | 9215 | 12.92 | 3965 | 4002 | 4040 | 407 | 4115 | 4153 | 4190 | 422 | 428 | 430 | 13 |
| 14 | 9190 | 9186 | 9181 | 9177 | 9172 | 9168 | 63 | 9159 | 9155 |  | 503 | 5079 | 5120 | 5160 | 520 |  | 5282 | 5322 | 5363 | 540 | 14 |
| 15 | 9132 | 9127 | 9123 | 9118 | 9113 | 9108 | 9104 | 9099 | 9094 | 14．9 | 1.6113 | 61 | 6200 | 6243 | 6287 |  |  | 6417 |  |  | 15 |
| 16 | 90 | 9069 | 90 | 9059 | 90 | 9 | 9044 | 9039 | 9034 |  | 1.7187 | 72 | 7280 | 7326 | 7372 | 7419 | 7465 | 7511 | 7557 | 7604 | 16 |
| 17 | 90 |  |  |  |  |  |  |  | 8973 |  |  |  |  | 8409 | 8458 | 8507 |  | 粏 | 855 | 37 |  |
| 18 | 8958 | 8953 | 894 | 894 | 893 | 893 | d | 8919 | 89 | 17 | ．933 | 9388 | 9440 | 9492 | 95 | 9596 | 9648 | 970 | 752 | 980 | 18 |
| 9 | 8901 | －89 | 88 | 88 |  | 887 |  |  | 8853 | 18.884 | 0410 | 0465 | 0520 |  |  | 06 | 0740 | 07 | 85 |  |  |
| 20 | 8843 | 8836 |  | 8824 | 8818 | 8811 | 8805 | 8799 | 92 | 878 | $2 \cdot 1484$ | 1542 | 1600 | 1658 | 1716 | 17 | 83 | 185 | 19 | 200 |  |
| 21 | 87 | 8778 | 8772 | 8765 | 8758 | 8752 | 8745 | 8738 | 8732 | 20.872 | 2.2558 | 2619 | 2680 | 2741 | 2801 | 2862 | 2923 | 2983 | 3044 |  |  |
| 22 | 87 | 8720 | 8713 |  |  |  | 8685 | 867 | 867 |  | 36 |  |  | 38 | 38 | 3951 | 40 | 40 | 4142 |  | 22 |
| 23 | 86 |  |  |  |  |  | 8626 | 8618 |  | $22 \cdot 86$ | ． 4707 | 4773 | 4840 | 49 | 49 | 5039 | 51 | 51 | 5239 | 5305 | 23 |
| 24 | 86 | 04 | 859 | 85 | 8581 | 74 | 8566 | 8558 | 8551 | 23 | 578 | 5850 | 5920 | 598 | 60 | 6128 | 6197 | 6267 | 63 | 640 |  |
| 25 | 85 | 8546 | 8538 | 85 | 8522 | 8514 |  |  | 8490 | 24.8 | 2.6855 | 6928 |  | 70 | 71 | 7217 | 7289 | 7361 | 74 | 75 | 25 |
| 26 | 8496 | 8487 | 8479 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | 83 | 8371 | 8362 | 835 | 8345 | 8336 | 8327 | 8318 | 8309 | $27 \cdot 83$ | ． 007 |  | 0240 | 0321 | 04 | 0483 | 0564 | 0645 | 0726 | 0807 |  |
| 2 | 8322 | 8313 |  |  |  | 8276 |  | 8258 |  |  |  |  |  |  |  | 1571 | 1655 | 1739 | 1823 |  |  |
| 30 | 8264 | 25 | 8245 | 8236 | 8226 | 8217 | 8207 | 8198 | 818 | 29 | 3.2226 | 2313 | 24 | 248 | 257 | 260 | 2747 | 2834 | 2920 | 300 | 30 |
| 31 | 8206 | 8197 | 8187 | 8177 | 8167 | 8157 | 8148 | 8138 | 8128 | 30．811 | 3.3301 | 3390 | 3480 | 35 | 365 | 3749 | 383 | 3928 | 4018 | 410 |  |
| 32 | 8148 | 8138 | 8128 |  | 8108 | 809 |  |  |  |  | 4375 |  |  | 4652 | 4745 | 483 | 493 | 5022 |  |  | 22 |
| 33 | 809 |  |  |  |  | 8039 | 802 | 8018 |  | 327997 | 3．544 |  | 56 | 57 |  |  | 602 |  | 212 |  | 33 |
| 34 | 803 | 802 |  |  |  |  |  |  |  | $33 \cdot 79$ | ． 6523 |  | 672 | 68 | 6916 | 7015 | 7113 | 7211 | 7310 | 740 | 34 |
| 35 | 79 | 7964 | 7953 | 7942 | 7931 | 7920 | 7909 | 7897 | 7886 | 34.7875 | 3.7597 | 7699 | 7800 | 7901 | 8002 | 8103 | 8205 | 8306 | 8407 | 8508 | 35 |
| 36 | 79 | 7906 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 37 | 785 | 784 |  |  |  |  | 778 | 777 | 7766 |  |  |  | 9960 |  |  | 02 | 0388 | 045 |  |  | 37 |
| 38 | 780 | 7789 | 777 |  |  |  | 7729 |  |  |  | ． 0820 |  |  |  |  |  |  |  |  |  | 38 |
|  | 7743 | 7731 | 7719 |  |  | 7882 | 7670 |  |  | 38．763 | 4 | 2007 | 212 | 233 | 2345 | 2458 | 25 | 表 | 2796 |  |  |
| 40 | 7685 | 7673 | 7660 | 7648 | 35 | 7623 | 761 | 759 | 7584 | 39．757 | 4.29 | 308 | 320 | 3315 | 343 | 354 | 366 | 377 | 389 | 400 | 40 |
| 41 | 7628 | 7615 | 7602 | 7589 | 7576 | 7563 | 7550 | 7537 | 7524 | 7511 | 4.4043 | 4161 | 4280 | 4398 | 451 | 4635 | 4754 | 4873 |  |  |  |
| 42 | 7570 | 755 |  |  |  |  |  |  |  | 41.745 |  | 5238 |  |  |  |  |  |  |  |  |  |
| 43 | 751 | 7498 | 748 | 7471 | 7458 | 7444 | 743 |  |  | $42 \cdot 73$ | $4 \cdot 61$ | 63 | 64 | 65 | 66 | 68 | 69 | 06 | 7186 |  | 43 |
| 44 | 745 | 7440 | 742 |  |  | 7385 |  |  |  | $43 \cdot 73$ |  |  |  |  |  |  | 80 | 8156 | 8283 |  | 44 |
| 45 | 7396 | 7382 |  |  |  | 7325 |  |  |  | 44726 | 4833 |  |  | 8730 | 8860 |  | 912 | 250 |  |  | 45 |
|  | 73 | 7324 | 730 |  | 7280 | 7266 |  |  |  | 45.72 |  |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 7280 | 72 | 72 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 | 72 | 72 | 71 |  |  |  | 7132 |  |  | $47 \cdot 70$ |  |  |  | 1978 | 211 | 22 | 23 | 2534 | 2672 |  | 48 |
| 49 | 716 | 14 |  |  |  |  |  |  |  |  | 5.26 | 27 | 2920 | 30 | 3203 | 334 | 348 |  |  |  |  |
| 50 | 7107 |  | 7076 |  |  |  | 70 |  |  | 49.69 | 5.37 | 385 | 4000 | 4144 | 428 | 4 | 457 | 472 | 867 | 50 | 50 |
| 5 | 704 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 69 |  |  |  |  |  |  |  |  | 51.684 |  |  |  | 6310 |  |  |  | 912 | 706 |  |  |
| 53 | 6933 | 69 | 69 |  |  | 68 | 68 |  |  | 52.678 | 5.69 |  |  | 73 | 754 | 76 |  |  | 815 |  |  |
| 54 | 6875 | 68 | 68 |  |  |  |  |  |  | ． 67 |  |  |  |  | 63 |  | 89 | 9100 | 925 |  |  |
| 55 | 6817 | 6800 | 6783 | 676 | 6748 | 673 | 6714 |  | 6679 | 54.666 | 5.9082 | 9241 | 9400 | 9559 | 9718 | 987 | －036 | 0195 | 0354 | 051 | 55 |
| 56 | 67 |  |  |  |  |  | 6654 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 67 | 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 66 |  |  |  |  |  |  |  | 6497 | $57 \cdot 64$ | $6 \cdot 2304$ |  |  |  |  |  |  |  |  |  |  |
| 59 | 6586 | 656 |  |  | 6512 | 64 | 64 | 64 | 6437 | $58 \cdot 641$ | 6.33 |  | 37 | 38 | 406 | 42 | 44 | 45 | 47 | 491 |  |
| 60 | 6528 | 650 | 64 |  |  | 643 | 6415 | 396 | 6377 | 59.635 |  | 462 | 4800 | 4973 | 5147 | 5320 | 549 | 5667 | 584 | 601 |  |
| 61 | 64 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 61.62 |  |  |  |  |  |  |  |  | 8035 |  |  |
|  | 635 | 633 | 631 |  |  | 625 | 62 | 6215 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | ， |  |  |  |  | －045 |  |  |  |
| 65 | 6238 | 621 |  |  |  | 613 |  |  |  | 64.605 | $6 \cdot 982$ | －0 | 0200 | 038 | 057 | 07 | 095 | 1139 | 32 | 151 |  |
| 66 | 61 | 61 | 6140 |  |  |  |  |  |  |  | 7.08 |  |  |  |  |  |  | 2234 | 2425 |  |  |
| 67 | 612 |  |  |  |  |  |  |  |  |  |  |  |  |  | 278 |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  | 7.30 |  |  |  |  |  |  | 442 | 析 |  |  |
| 69 | 600 | 5986 |  |  | 592 |  | 58 | 5855 | 込 | 68.58 | 74120 | 43 | 4520 | 471 | 49 |  | 5318 | 551 | 57 |  |  |
| 70 | 595 | 59 | 5906 |  |  |  | 5817 | 5795 | 73 | 69.57 | 7.5195 |  |  | 5802 |  |  |  |  | 6814 |  |  |
| 71 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 583 | 58 | 5789 | 57 | 5743 | 572 | 56 | 5675 | 5652 | 71.56 | 73 |  |  |  | 817 | 83 | 85 |  | 900 |  |  |
|  | 5776 |  |  |  |  | 5661 |  |  | 5592 |  | 7.8417 |  |  | 95 | 926 | 473 |  |  | 1 |  |  |
|  | 57 |  |  | 5648 | 5625 | 560 | 5578 | 5555 | 5531 | 73.550 | 94 | 9706 | 9920 | －133 | 0347 | 056 | 077 | 098 | 120 | 14 |  |
| 75 | 5660 | 563 | 5613 |  | 5566 | 5542 | 5518 | 5495 | 5471 | 74．5447 | 05 | 0783 | 1000 | 1216 | 1433 |  | 18 | 2084 | 2301 | 25 | 75 |
| 76 | 56 | 5579 | 5555 |  | 5507 |  | 5459 | 5435 | 10 | 75.5 | 1671 | 18 | 2080 | 22 | 2519 | 27 |  | 3178 | 339 | 37818 | 76 |
|  | 534 |  |  |  |  |  |  | 5 |  | － |  | 237 | 析 |  | 360 | 退 |  |  |  |  |  |
|  | 5487 | 5462 | 54 | 5413 | 5389 | 5364 | 5339 | 5314 | 5290 | $77 \cdot 526$ | 8.378 | 401 | 4240 | 4465 | 469 | 49 | 5142 | 5367 | 559 | 5818 |  |
| 79 | 5429 | 4.04 | 5379 |  |  |  | 79 | 254 | 229 | ． 520 | 8 4863 | 5014 | 532 | 5548 | 577 | 600 | 233 | 6462 | 6693 |  |  |
| 80 | 5371 | 534 | 5321 | 5296 | 5270 | 5245 | 5220 | 5194 | 5169 | 79.514 | 5937 | 616 | 640 | 663 | 686 | 709 | 732 | 755 | 778 | 80 | 80 |
|  | 531 |  |  |  | 521 | 51 |  | 5134 | 5108 |  | 8.70 | 7245 | 7480 | 771 | 794 | 8182 | 8416 | 8651 | 888 |  |  |
| 82 | 5255 | 5229 | 52 | 5178 | 515 | 512 | 00 | 507 | 50 | 81.502 | 8．808 | 8322 |  | 879 | 903 |  | 950 | 974 | 998 | ${ }^{2}$ |  |
| 83 | 5197 |  |  |  |  | 5067 |  | 退 | der |  |  |  | 641 | 8872 | 1 | 16 | 0 | 8 | 107 |  |  |
| 84 | 5139 | 5113 | 5087 | 50 | 503 | 5007 | 4981 | 4954 | 492 | 83.49 | 9.0234 | 047 | 0719 | 096 | 120 | 1448 | 169 | 193 | 2177 | 24 |  |
| 85 | 5082 | 50 | 5028 | 5002 | 4975 | 4948 |  | 4894 |  | 84．4840 | 9．1308 | 1554 | 179 | 204 | 229 | 253 | 278 | 3028 | 3274 | 35 |  |
| 86 | 5024 | 4997 | 49 |  | 4 |  |  | 粧 |  |  |  |  |  | ， | 337 | 626 |  |  |  |  |  |
| 87 | 4966 | 493 | 491 | dos | 485 | 482 | ， | 474 | 4746 | 87 | 9.3456 | 3708 |  | 421 | 4，63 | 474 | 4966 | 521 | 5469 | 572 |  |
| 88 | 4908 | 488 | 4853 | 482 | 479 | 4770 | 4742 | 4714 | 4686 | 87.465 | 45 | 47 | 5039 | 5294 | 554 | 5803 | 6057 | 6312 | 656 | 68 |  |
| 89 | 4850 | 222 |  |  | 4738 | 475 | 4682 | 5 6 | 4625 | ． 459 |  | S82 | 611 | 6377 | 6634 | 689 | 840 | 7 | 766 | 921 |  |
| 90 | 4792 | 4764 | 4736 | 4708 | 4679 | 4651 | 4622 | 4594 | 4565 | 89.4536 | 667 | 6939 | 719 | 7460 | 7720 | 798 | 824 | 850 | 876 | 902 |  |
| 91 | 4734 | 706 | 4677 | 464 | 46 | 4591 | 4562 | 33 | 4505 | 90．44 | 9.775 | 研 | 8279 | 854 | 8806 | 906 | 9332 |  | 85 | 1 |  |
| 92 | 4677 | 4648 | 4619 | 4590 | 4561 | 4532 | 4503 | 4473 | 4444 | 91／44 | 9.8827 | 9093 | 935 | 962 | 989 | 1158 | 42 | 0690 | 095 | 2 |  |
| 93 | 4619 | 459 | 4560 | 4531 | 4502 | 4472 | 疗 | 13 | 4384 | 92.435 | ＇990 | －170 | 0439 | 0708 | 097 | 12 | 1518 | 1784 | 2053 | 232 |  |
| 94 | 4561 | 4531 | 450 | 4472 | 4443 | 4413 | 4383 | 4353 | 4323 | 93.429 | 10.097 | 1248 | 1519 | 179 | 20 | 233 | 260 | 2878 | 3150 | 342 | 94 |
| 95 | 45 | 4473 |  |  |  |  |  |  |  | － | $10 \cdot 205$ |  |  | 咗 |  | 3424 |  |  | 4248 | 452 | 95 |
| 96 | 4445 |  |  |  | 432 |  | 264 |  |  | 55472 |  |  |  |  | 4232 | 45 | 4 | ， | 545 |  | 96 |
| 97 | 438 | 4357 | 432 | 429 | 426 | 4235 | 4204 | 417 | 4142 | 96.411 | 10 |  | 47 | 504 | 53 | 56 | 58 | 6162 | 6442 | 672 |  |
| 98 | 4329 | 4299 | 4268 | 4237 | 4206 | 4175 | 4144 | 4113 | 4082 | 97－405 |  | 5556 | 5839 | 6123 | 6406 | 6690 | 6973 | 725 | 7540 |  |  |
|  | 寿 |  | 2 |  | 4147 | 4116 |  | 4053 | 4021 | 98．3990 | 10.6347 |  | 699 | 7206 | 49 | 777 | 80 | 83 | 8637 | 823 |  |
|  | 4214 | 4182 | 415 | 4120 | 4088 | 4056 | 4025 | 3993 | 3961 | 993929 | $10 \cdot 7421$ | 7710 | 7999 | 8289 | 8578 | 8867 | 9156 | 9445 | 9734 | ${ }^{+}$ | 100 |
|  | $50^{\prime}$ | $49^{\prime}$ | 18 | $47^{\prime}$ | 46 | 45 | $44^{\prime}$ | $43^{\prime}$ | $42^{\prime}$ | $41^{\prime}$ | 50 | $49^{\prime}$ | $48^{\prime}$ | 47 | $46^{\prime}$ | 45 | $44^{\prime}$ | $43^{\prime}$ | $42^{\prime}$ | $41^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Cos | NE． |  |  |  |  |  |

TRAVERSE TABLES.

|  | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $T^{27^{\prime}} 188^{2} /$ |  |  |  |
|  | 9939 |  | 9938 | 9938 | 19938 |  | 9937 |  |  |  |  |  |  |  | 117 |  | 1220 |  |  |  |  |
|  |  | ${ }^{9816}$ | ${ }_{9815}^{987}$ | ${ }^{9814}$ | 98813 | 9812 | 9874 |  |  | ${ }^{1} 2.9888$ | ${ }_{330}^{2206}$ | 18 |  | ${ }_{333}^{2224}$ | ${ }_{3344}^{2229}$ | ${ }_{3353}^{2235}$ |  |  |  |  |  |
|  |  |  | 9792 | 9752 | 975 | ${ }^{974} 9$ | 9788 | 9764 9 |  |  |  | ${ }_{5}^{4424}$ | ${ }_{5}^{4346}$ | ${ }_{559}^{4447}$ | 4459 | ${ }_{4}^{44708}$ | ${ }_{\substack{4482 \\ 5602}}^{\substack{\text { che }}}$ |  |  |  |  |
|  | 634 | 938 | 30 | 19628 | 19626 | 9624 | 19622 | 9620 | 9618 |  | 19 | 6636 | 6553 | 6671 | 6688 | 6705 | 6723 | 6740 | 6758 |  |  |
|  |  |  |  |  | ${ }^{9554}$ | 9899 | 9596 | 9454 |  |  |  | ${ }_{8848}^{774}$ |  | 7783 |  |  |  |  |  |  |  |
|  |  |  |  |  | 9439 | 9436 | 9433 | 9430 |  |  |  | 9954 | 998 | ${ }^{2006}$ |  |  |  |  |  |  |  |
| 118 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{93254}$ | ${ }_{926}^{932}$ | 9318 | ${ }_{925}^{9314}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2207 |  | 9198 | 9294 | 1930 |  | d |  | 917 |  |  | ${ }_{4378}$ | 4416 |  |  | 4559 | 4566 |  |  |  |  |
|  |  | 914 | 9137 | 9,32 | 928 | 9123 | 9118 | 9114 | 9109 |  |  | 5484 |  |  |  |  |  |  |  |  |  |
|  |  |  | 9013 | 900 | 9003 |  | 893 | ${ }^{8987}$ | 8982 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | $895$ |  | $894$ |  |  |  |  |  |  |  | 8851 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 88 | 83 |  |  |  |  |  | 121 |  |  |  |  |  |  |  |
| $\frac{20}{21}$ | 8718 | 8712 | 87 | 8898 | 8691 |  | 8678 | 8871 | 866 |  |  | 322 |  | 334 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 589 |  |  |  |  |
|  | 8474 |  | ${ }_{8458}$ | 8450 | 8442 | 8434 | 8426 | ${ }_{8418} 8$ | 8409 |  | ${ }_{2}$ |  |  | 603 | 7857 |  |  |  |  |  |  |
|  | 3413 |  | 839 |  |  |  |  | 835 |  |  | 2:8681 |  | 88 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1292 |  |  |  |  |  |
|  |  |  | ${ }_{8211} 8$ | ${ }^{8204}$ | ${ }_{8193}^{825}$ | ${ }_{8183}^{8246}$ | ${ }^{82374}$ | ${ }^{8228}$ | ${ }^{82155}$ |  |  | 208 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{8047}^{8108}$ | 809 | ${ }_{8028}^{8088}$ | ${ }^{8078} 8$ | ${ }^{80088}$ |  |  | 7974 |  |  |  | ${ }_{533}^{4287}$ | ${ }^{43785}$ | 466 | 455 | ${ }_{5763}^{4645}$ | 4855 | ${ }_{5948}^{4824}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 79 |  | 7881 |  | 78 | 784 | 7837 |  |  |  |  | 780 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 742 | 7730 | 7718 | 788 | 7794 | 7688 | 7730 | 7258 | 7710 |  | 3:9713 | ${ }^{9817}$ | ${ }^{9923} 1$ | 125 | 0129 | ${ }^{0233} 1$ | 0337 | 0441 | 0545 |  |  |
|  |  |  | ${ }_{7}^{7595}$ | ${ }_{75}^{764}$ | ${ }_{7}^{7} 783$ |  |  |  |  |  |  |  |  |  |  | ${ }^{2458}$ | 23 |  |  |  |  |
|  |  |  |  |  |  | 7494 | 584 |  |  |  |  | 3241 |  |  |  |  |  |  |  |  |  |
| $40$ | ${ }_{7}^{7498}$ | ${ }_{7423}^{7485}$ | ${ }^{710} 4$ | ${ }^{74388}{ }^{7} \times$ | ${ }_{7383}^{7453}$ | ${ }_{7369}^{733}$ | ${ }_{7355}^{7418}$ | ${ }_{7342}^{7305}$ | 7328 |  |  |  | ${ }^{54655}$ | 558 |  |  |  |  |  |  |  |
|  |  | 736 | 7348 | 7334 | 7320 | 7306 | ${ }_{7292}$ | ${ }_{727}^{734}$ | 7264 |  | ${ }_{4}^{4} 77334$ | 7559 | ${ }_{768}^{651}$ |  |  |  | 8180 | 8305 |  |  |  |
|  |  |  |  |  | 725 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 210 |  |  |  |  |  |  |  |  |  | 03 |  |  | 042 |  |  |  |  |
|  | 1193 | 717 | 7163 |  | 7331 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7071 | 70 | 704 | 702 | 7009 | 7993 | 6977 | 6962 | 6946 |  |  |  | 27 | 23 |  | ${ }_{3644}^{2226}$ | 83 | 27921 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 868 |  |  |  | 49.68 | 5.515 |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{6888}$ | ${ }^{688}$ | 685 | 687 | ${ }_{6875}^{6822}$ |  | ${ }^{67788}$ | 年772 |  |  |  |  | ${ }^{6554}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 66 | 6670 | 6552 | ${ }^{6635}$ | 6617 | 6600 | ${ }^{5582}$ | 6564 |  |  | 9725 | 98a | . 13 |  | 034 |  |  |  |  |  |
|  | 6582 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 6390 | ${ }^{6348}$ | ${ }_{63}^{643}$ | ${ }_{6342}^{642}$ | ${ }^{6385}$ | ${ }^{638}$ | ${ }^{6348}$ | ${ }^{6329}$ | ${ }^{631}$ |  |  | 414 |  |  |  | 4822 | 4987 | 5155 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | ${ }_{6}^{6 \cdot 6188}$ | 636 |  |  |  |  |  |  |  |  |  |
|  | ${ }_{6216}^{6277}$ | ${ }^{625}$ | 6238 <br> 6176 | ${ }_{6}^{62156}$ | ${ }_{6}^{61988}$ | ${ }^{1116}$ | 6593 | ${ }^{6139}$ | 6119 |  |  |  | ${ }_{8}^{7643}$ |  |  | 8172 | 8349 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 5949 |  |  |  |  |  | 115 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 1891 |  |  |  |  |  |  |  |  |  |
|  | 5972 | 58 | ${ }_{5888}^{5930}$ | 5846 | ${ }_{5824}^{5887}$ | ${ }_{\substack{5885 \\ 5803}}^{5}$ | 578 | 5759 | 573 |  |  | ${ }_{2103}^{2937}$ |  | 4491 |  |  | 597 | 4142 | S435 4 |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 7.50 | 5209 | 5406 | 5502 | 5799 |  | 6192 |  |  |  |  |
|  | ${ }_{5}^{5728}$ | 5767 | ${ }_{5683}^{574}$ |  | ${ }_{5638}^{5700}$ | 5615 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{5667}$ | ${ }_{5}^{564}$ | ${ }_{5}^{5621}$ | 5596 | 5575 |  | 5529 |  | 548 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5484 | 5460 | 5436 |  | 538 | 5364 | ${ }_{531}$ | 531 |  |  | ${ }_{8}^{81}$ | 1845 |  | 2273 | ${ }_{248}^{123}$ |  | 2915 |  |  |  |  |
|  |  |  |  |  |  |  |  | 525 |  | 74.52 | 8 82 | 2951 | 3168 |  |  |  |  |  |  |  |  |
|  | 5362 |  | 53 |  | 5204 |  | 5215 |  | 516 |  |  | ${ }_{4}^{4057}$ |  | 560 |  | 505 | 5156 |  |  |  |  |
|  |  |  | 5189 | S164 | 5139 | ${ }_{5114}$ | 508 | 5063 | 503 |  |  | 5153 | ${ }_{6}^{3385}$ |  |  |  | ${ }^{737}$ |  | ${ }_{788} 78$ |  |  |
|  |  | 5153 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 80 \\ & 8181 \\ & 882 \\ & 894 \\ & 854 \\ & 85 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | $4{ }^{4} 4883$ | 4845 | 478 | 4732 | 476 | ${ }_{4}^{4738}$ | 4710 | 4683 | 455 |  | 9.1 |  | ${ }_{3148}^{238}$ | 3391 |  |  | 2989 |  |  |  |  |
|  |  |  | 14758 | 4730 | 4703 | 4675 |  | 4620 |  |  | 9.3 | 4011 |  |  | 4749 |  |  |  |  |  |  |
|  | 4751 | ${ }_{462}^{4724}$ | ${ }^{4696}$ |  | ${ }_{4}^{4640}$ | ${ }_{4}^{4650}$ | ${ }_{452}^{4584}$ | ${ }_{4536}^{4596}$ | 4 |  |  |  |  |  |  | 6172 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 454 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 43 | 43 | 4296 | 426 |  |  |  |  |  |  |  | 20 | 2286 |  | 2817 |  |  |  |  |  |
|  |  |  |  |  |  |  | 414 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 414 | 488 | 404 | 4081 |  | 395 | 943 | 10.4 |  | 336 | 45 |  |  |  | 719 |  |  |  |
|  |  | ${ }_{4}^{4170}$ |  |  | ${ }_{3055}^{4017}$ |  | 395 | 3323 | 3892 |  |  |  | 6455 |  |  |  |  | 7843 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | $36^{\circ}$ ' | $3^{35}$ |  | 33 | 32 | 31 |  |  |  |  |  | 35' |  |  |  | 31 |  |
|  | Sine. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 6 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $6^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | $34^{\prime}$ | $35^{\prime}$ | $36^{\prime}$ | 37 | $38^{\prime}$ | 39 | $3{ }^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | 33＇ | $34^{\prime}$ | 35 | 36 | 371 |  |  |  |
|  | 9936 | 993 | 9935 | 9935 | 9934 | 9934 | 9934 | 9933 | 9933 | 9933 | 132 | 1135 | 1138 | 114 | 1144 | 1146 | 1149 | 52 |  |  |  |
|  | 987 | 987 | 9870 | 98 | 9869 | 9868 | 98 |  |  | 1.9 | 220 | 2270 | 22 | 2281 | 2287 | 2293 | 2299 | 5 | 2310 |  |  |
|  |  |  |  | 9804 |  |  |  | O | 97 | 2.979 | 3396 | 3405 | 3413 | 3422 | 3431 | 34 | 3448 | 3457 | 3465 | 34 |  |
|  | 9743 | 9742 | 40 | 9739 | 9738 | 9736 | 973 | 9734 | 973 |  |  | 45 | 4551 | 456 | 4574 | 45 | 459 | 4609 | 4621 |  |  |
|  | 79 | 9677 | 9675 | 9674 |  | 9670 | 9669 | 9667 | 9665 | 4.9664 |  | 567 | 5 | 5704 | 5718 | 573 | 574 | 5761 | 5776 |  |  |
|  | 9614 | 9612 | 9610 | 9608 | 9606 | 9604 | 9602 | 9600 | 95 | 5.959 | 792 | 6810 | 6827 | 6844 | 68 | 6879 | 6896 | 6914 | 6931 | 6948 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 802 | 8046 | 8066 | 8086 |  |  |
|  | 9486 | 94 | 9480 | 9478 | 9475 | 9472 | 9470 | 9467 | 946 |  |  |  | 9102 | 912 | 9149 | 9172 | 919 | 9218 | 9241 |  |  |
|  |  |  | 94 |  |  |  | 9404 | 101 |  | 93 |  | 02 | 02 | 026 | 2 | 0318 | 034 | 0370 | 396 |  |  |
| 10 | 9357 | 9354 |  |  |  |  |  |  |  | 9.932 | 20 | 1349 | 1378 | ， 12 | 13 | 146 | 1494 | 152 | 1552 |  |  |
| 11 | 929 | 9289 | 9286 | 9282 | 9278 | 9275 | 927 | 9267 | 9264 | 10.926 | ． 2452 | 2484 | 2516 | 2548 | 2580 | 2611 | 2643 | 2675 |  |  |  |
| 12 | 922 | 92 | 92 | 921 | 9213 | 920 | 92 | 9201 | 9197 | 11 | 3584 | 36 | 36 | 36 | 3723 | 3758 | 3792 | 382 | 3862 |  |  |
| 1 | 91 |  | 9156 | 91 | 9147 | 9143 |  | 9134 |  | 1291 | 4716 | 475 | 47 | 4829 | 486 | 4904 | 4942 | 4979 | 501 |  |  |
| 14 | 91 | 9095 | 9091 |  |  |  |  |  | 9063 |  |  | 58 |  |  | 601 | 605 | 6091 | 6132 | 61 |  |  |
| 15 | 9036 |  | 9026 | 9021 | 9016 | 9011 |  | 9001 | 8996 | 14 | ． 6980 | 702 | 7067 | 7111 | 7154 | 719 | 72 | 7284 | 7327 | 737 |  |
| 16 | 89 | 8966 | 8961 | 8956 | 8950 | 8945 | 8940 | 8934 | 8929 | 15 | ＇8113 | 8159 | 8205 | 8251 | 8297 | 8344 | 8390 | 8436 | 8482 | 852 |  |
| 17 |  |  |  |  |  |  |  |  |  | 16.88 |  |  |  |  |  | 9490 |  |  |  |  |  |
| 18 | 88 | 883 | 8831 | 8825 | 8819 | 8813 | 8807 | 8801 | 87 | 17 | 2.037 | 0429 | 04 | 053 |  | 0637 |  | 0741 |  |  |  |
| 19 |  | 87 |  |  |  |  |  |  |  | 18 | 2.15 | 15 | 16 | 1673 | 172 | 178 | 183 | 189 | 1943 |  |  |
| 20 | 87 | 8708 |  |  |  |  |  |  |  |  | $2 \cdot 26$ |  | 2756 | 281 | 287 | 293 | 2987 | 304 | 110 |  |  |
| 21 | 86 | 8643 | 8636 | 8629 | 8622 | 8615 | 8608 | 8601 |  | 20.858 | 377 | 3833 |  |  |  | 4076 |  |  |  |  |  |
| 2 | 85 | 85 | 85 | 8564 | 8557 | 854 | 854 | 85 | 852 | 21.85 | 2490 | 49 | 5032 |  | 5159 | 52 | 52 | 5350 |  |  |  |
|  | 85 | 85 | 850 |  |  |  |  |  | 8460 | 22 | $2 \cdot 603$ | 610 |  | 623 | 63 | 636 | 64 | 6502 | 656 | 66 |  |
| 24 | 845 | 84 | 8441 | 8433 | 8425 | 8417 |  |  | 8393 |  | $2 \cdot 7169$ | 7238 |  | 737 |  | 751 | 源 | 765 |  |  |  |
| 25 | 83 | 8385 | 8376 |  |  | 8352 | 8343 | 8335 | 8326 | 24 | ．8301 | 837 | 84 | 8518 | 8590 | 866 | 873 | 808 | 8879 | 895 |  |
| 26 | 8329 | 8320 | 8312 | 8303 | 8294 | 8286 | 8277 | 8268 | 8259 | 25.825 | 2.9433 | 9508 | 9583 | 9658 | 9733 | 9809 | 9884 | 9959 | 1034 | 010 |  |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 111 |  |  |  |
| 28 | 82 | 819 | 8182 | 81 | 8163 | 8154 | 8144 | 8135 | 8126 | 27 | 16 | 177 |  |  |  | 210 |  | 226 |  |  |  |
| 29 |  |  |  |  |  |  |  |  | 8059 | 28 | $3 \cdot 282$ | 29 |  | 308 | 31 | 32 | 33 | 341 | 34 |  |  |
| 30 | 80 |  |  |  |  | 802 |  |  | 7992 | 297982 | ， | 40 | 4134 | 422 | 4308 | 439 | 448 | 456 | 465 | 47 |  |
| 31 | 800 | 7997 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 79 | 7932 | 792 | 791 | 7901 | 7890 | 787 |  |  | 31 | 3．62 | 63 |  |  |  |  |  |  |  |  |  |
| 33 |  |  |  |  |  |  | 7813 |  |  | 32 | 735 |  |  |  |  | 7834 | 7929 | 8025 | 8120 | 821 |  |
| 34 | 7814 |  |  |  |  | 7758 |  |  |  |  |  |  | 86 | 873 |  |  | 907 | 917 |  | 93 |  |
| 35 | 7750 | 773 | 7727 | 7715 |  | 929 | 7680 | 7669 | 657 | 34 | 3.9621 | 972 | 98 | 992 |  | 01 | 022 | 032 | 043 | 053 |  |
| 36 | 76 | 7674 | 7662 | 7650 |  | 7626 | 7614 | 7602 | 7590 | 35．757 | 4.0753 | 085 | 0961 | 1065 |  | 1273 | 1377 | 1481 | 1585 | 168 |  |
|  | 76 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 263 |  |  |  |
| 38 | 755 | 7545 | 753 |  |  | 7494 |  |  |  |  | 3017 |  |  | 33 |  |  | 36 |  |  |  |  |
| 39 | 749 | 7480 |  |  |  | 7428 |  |  | 7389 |  |  |  |  | 44 |  | 47 | 4826 | 493 |  |  |  |
| 40 | 742 | 石 | 7402 | 7389 | 7376 | 7362 | 7349 | 7336 | 7322 | 3973 | 4528 | 539 | 5512 | 562 | 574 | 585 | 597 | 609 | 620 | 632 |  |
| 41 | 736 | 7351 | 733 | 7324 |  |  |  |  |  | 40 |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 730 | 7286 |  |  |  |  | 72 |  | 718 | 417 | $4 \cdot 75$ |  |  |  |  |  |  |  |  |  |  |
| 43 | 72 | 72 |  |  |  | 7165 |  |  | 712 | 42 | 4.86 |  |  | 90 |  |  | 94 | 9547 |  |  |  |
| 4 | 7172 | 57 |  |  | 析 | 7099 |  |  | 7055 | 43 | $4 \cdot 98$ |  | 1064 | 019 |  |  | 0572 |  | 0827 |  |  |
| 45 | 710 |  |  |  |  |  |  |  |  |  |  |  |  | 33 |  |  | 1722 | 1852 | 1982 |  |  |
| 46 | 7043 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 47 | 69 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4020 |  | 429 |  |  |
| 48 | 6915 | 68 | 688 | 686 | 6851 | 6835 | 68 | 6803 | 6787 | 47 | $5 \cdot 4338$ |  |  | 475 |  |  | 5170 |  |  |  |  |
| 49 | 685 |  |  |  |  |  |  |  |  |  |  |  |  | 58 |  |  |  |  |  |  |  |
| 50 | 6786 | 6769 | 6753 | 6736 | 6720 | 6703 |  | 6670 | 6653 | 49 | 5.6602 | 6746 | 6891 | 70 | 7180 | 73 | 7469 | 61 | 7758 | 7902 |  |
| 51 | 6722 |  | 668 |  |  | 663 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 665 | 6640 | 662 | 660 | 6589 | 657 | 655 | 65 | 6519 | 51.6 | 5.88 |  |  | 93 |  | 96 |  | 918 |  |  |  |
| 53 | 659 | 6576 | 655 | 65 | 6523 | 65 | 648 | 64 | 6452 | 52.6 |  |  |  | 045 |  |  |  |  |  |  |  |
| 54 | 65 | 65 |  |  |  |  |  | 6403 | 6385 | 53.636 |  |  |  | 159 |  |  |  | 222 |  |  |  |
| 55 | 646 | 64 |  |  |  |  | 63 |  | 6318 |  | 6262 | 242 | 258 | 273 | 289 |  | 321 | 3374 | 3533 | 36 |  |
| 56 | 640 |  |  |  |  |  |  |  | 6251 |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 63 |  |  |  |  | 624 |  |  | 618 |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 62 | 6253 | 6233 | 621 | 6195 | 6176 |  |  | 6117 |  |  |  |  | 616 |  |  |  |  |  |  |  |
| 59 | 62 | 6188 |  |  |  |  |  |  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 | 61 | 6123 | 6103 | 6084 |  | 6044 | 6024 | 6004 | 5983 | 50 | 7922 | 80 | 826 | 8442 | 86 | 878 | 896 | 13 | 930 | 9482 |  |
| 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 6015 | 59 | 597 | 595 | 5932 | 5912 |  |  | 5850 | 61．58 |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 595 | 59 |  |  |  |  |  |  | 5783 | $62 \cdot 5$ |  |  |  |  |  |  |  |  |  |  |  |
| 64 |  |  |  |  |  |  |  |  |  |  |  |  |  | 300 |  |  |  |  |  |  |  |
| 65 | 58 | 5800 |  | 575 | 5736 | 5714 | 569 |  | 5649 |  |  |  |  | 4 | 43 |  |  | 4897 | 50 |  |  |
| 66 | 575 |  |  |  |  |  |  |  | 558 |  | 714 |  |  |  |  |  |  | 602 |  |  |  |
| 6 | 569 |  |  |  |  | 5s |  |  | 5515 | 6654 |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 56 |  |  |  |  |  |  |  | 5448 | 67.54 |  |  |  |  |  |  |  | 85 |  |  |  |
| 69 | 55 | 5542 | 551 |  | 5473 | 5450 |  |  | 538 | 68.53 | $7 \cdot 8110$ | 83 | 85 |  |  |  |  | 958 |  |  |  |
| 70 | 55 | 5477 | 54 |  |  | 538 | 536 | 53 | 512 |  | 18210 | 945 | 964 | 984 | ＋051 | 25 | 045 | 65 | 80， |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 537 | 53 | 532 | 53 | 5276 | 525 | 522 | 520 | 5180 | 71. | 8.1506 | 17 | 19 | 213 | 233 | 25 | 27 | 2963 | 317 |  |  |
|  | 5307 | 5283 |  |  | 5 | 518 | 5162 | 5138 | 5173 | $72 \cdot 5$ | 8263 | 284 | 30 | 327 | 348 | 36 | 39 | 41 | 432 |  |  |
| 74 | 5243 |  |  |  |  | 5121 |  |  | 析 | 咗 |  |  | 419 | 4412 | 462 | 48 | sos | 526 |  |  |  |
| 75 | 5179 | 51 | 5129 | 51 | 5080 | 505 | 503 | 5004 | 4979 | 74＊495 | 490 | 511 | 53 | 555 | 57 | 598 | 620 | 642 | 6636 | 685 |  |
| 76 | 511 | 5090 | 5064 |  | 5014 | 4989 | 4963 | 4938 | 4912 |  | $8 \cdot 603$ | 625 | 647 | 763 | 69 |  |  | 757 | 析 |  |  |
|  | 5050 |  |  |  |  | 4923 |  | 487 | 4 |  |  |  | 761 |  | 80 | 827 | 85 | 872 | 894 |  |  |
| 78 | 498 | 4960 | ¢ |  |  | 485 |  |  | 4778 |  |  |  |  | － | 920 |  | 965 | 1018 | ， |  |  |
| 79 | 492 | 4896 | 4870 | 48 | 4817 | 4791 | 476 | 473 | 4712 | 78.46 | 943 | 96 | 98 | －115 | 0344 | 057 | 08 | 102 | 125 |  |  |
| 80 | 4858 | 4831 | 4805 | 47 | 4752 | 472 | 4698 |  | 4645 |  | 9.0563 | 0794 | 12 | 256 | 148 | 171 | 1950 | 2181 | 241 |  |  |
| 8 | 479 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4729 | 4 | 46 | 46 |  | 4593 |  | 4538 | 451 |  | 9．282 |  | 3 | 3538 | 377 | 4012 | 424 | 448 | 472 |  |  |
| 83 | 466 | 46 | 4610 | 45 | 4555 | 4527 | 4499 | 4472 | 4444 | 82．4416 | 3959 | 418 | 4438 | 4678 | 491 | 515 | 539 | 5638 | 587 |  |  |
| 84 | ， | 4573 |  | 4517 | 4489 | 4461 | 4433 |  | 4377 | 83.434 | O91 | 5333 | 557 | 5819 | 6062 | 6304 | 654 | 6790 | 838 |  |  |
| 85 | 4536 | 4508 | 448 | 445 | 4424 | 4395 | 43 | 433 | 4310 | 84.428 | 622 | 646 | 671 | 696 | 720 | 751 | 769 | 794 | 818 | 343 |  |
|  | 447 | 4443 | 4415 | 4387 | 4358 | 4329 | 430 | 42 | 424 | 85 |  | 763 | 78 | 810 | 83 | 859 | 88 | 909 | 9343 |  |  |
| 87 | 4408 | 4379 | 435 | 4 | 429 | 4263 | 4234 | 4205 | 4176 | 86 | 9.848 |  |  | 924 | 949 | 974 | 999 |  | － |  |  |
| 88 | 4343 | 4314 | 4285 | 4256 | 42 | 4197 | 4168 | 4 | 4 |  | 9.961 |  |  |  | 6， | 089 | 1145 | 139 | 165 | 1908 |  |
| 89 | 4279 | 4250 | 422 | 4191 | 41 | 413 | 410 | 40 | 404 | 88．4012 | 10.075 | 100 | 126 | 152 | 178 | 203 | 22 | 25 | 2808 | 306 |  |
| 90 | 4215 | 85 | 4155 | 4125 | 4096 | 4066 | 4036 | 4005 | 3975 | 89.3945 | 10.1883 | 2143 | 2403 | 2663 | 2923 | 318 | 3443 | 3703 | 3964 | 422 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4593 | 485 |  |  |  |
| 92 | 4086 | 40 | 40 | 3995 | 3964 | 3934 | 39 | 3372 | 3841 | 91381 | 10414 | 4413 | 4679 | 494 | 5210 | 54 | 574 | 60 | 62 |  | 92 |
| 93 | 4022 | 3991 |  | 3930 | 3899 | 3868 | 3837 | 3806 | 3774 | $92 \cdot 374$ | 10.527 | 55 | 58 | 608 | 635 | 662 | 6892 | 7160 | 742 | 769 | 93 |
| 94 | 3958 | 3927 | 3895 | 3864 | ， | 3802 | 3 370 | 3739 | 析 |  | － | 668 | 6954 | 22 | 7498 | 析 | － | 8313 | 853 |  |  |
| 95 | 3893 | 3862 | 3831 | 37 | 3768 | 37 | 370 | 3672 | 3640 | 94．360 | 10.7543 | 781 | 809 |  | 864 | 89 | 91 | 946 | 973 | ＋0 |  |
| 96 | 3829 | 3797 | 37 | 3734 | 3702 | 3670 | 3638 | 3606 | 3573 | $95 \cdot 35$ | 10.867 | 895 | 923 | 9507 | 9785 | 1062 | 0340 | 0617 | 89 | 117 |  |
|  | 3765 | 3733 |  | 3669 | 3636 | 析 | 357 | 3539 | 3507 | $96 \cdot 34$ | 10.980 | ． 08 | 036 | 064 | 0928 | 120 | 488 | 1769 | 205 | 233 |  |
| 98 | 3700 | 36 | 3636 |  | 3571 | 3538 | 35 | 34 | 3410 | 97．3407 | 939 | 22 | 150 | 17 | 2072 | 235 | 26 | 29 | 3205 | 3488 |  |
| 99 | 3636 | 3604 | 3571 | 3538 | 3505 | 3472 | 3439 | 3406 | 3373 | 98．3339 | $11 \cdot 2071$ | 235 | 264 | 2929 | 3216 | 3502 | 3788 | 4074 | 4360 | 464 | 99 |
| 100 | 3572 | 3539 | 3506 | 込 | 4440 | 3406 | 3373 | 339 | 3306 | 99－3272 | 11.3203 | 3492 | 3781 | 4070 | 435 | 4648 | 4937 | 5226 | 5515 | 04 | 100 |
|  | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | $26^{\prime}$ | 25 | $24^{\prime}$ | $23^{\prime}$ | 22 | $21^{\prime}$ | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ |  | $26^{\prime}$ | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ | $22^{\prime}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 6 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $6^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $41^{\prime}$ | $42^{1}$ | $43^{\prime}$ | $44^{1}$ | 45＇ | $46^{\prime}$ | 47 | $48^{\prime}$ | $49^{\prime}$ | $40^{\prime}$ | $41^{\prime}$ | $42^{\prime}$ | $43^{\prime}$ | $44^{\text {I }}$ | 45 |  |  | 48＇ | 49 |  |
|  | 9932 | 99 | 99 | 9931 | 993 | 993 | 9930 | 9930 | 9930 | 92 | 116 | 116 | 1167 | 1170 | 1172 | 1175 | 1178 | 1181 | 1184 | 187 |  |
|  | 9865 | 986 | 98 | 9863 | 9862 | 9861 | 98 | 986 | 9859 | 1.985 | 2322 | 2328 | 2333 | 2339 | 2345 | 2351 | 235 | 2362 | 2368 | 237 |  |
|  |  |  | 979 | 979 | 9793 | 9792 |  |  | 978 | 崖 | 3483 | 349 | 3500 | 3509 | 3517 | 26 | 353 | 3543 | 3552 | 356 |  |
|  | 9730 | 9728 | 972 | 972 | 9724 | 9723 |  |  | 9719 |  | 644 | 465 | 466 | 4678 | 469 | 470 | 47 | 4725 | 4736 | 474 |  |
|  | 9662 | 660 | 9659 | 9657 | 9655 | 9653 | 9652 | 9650 | 9648 | 4.9 | 5805 | 581 | 5834 | 5848 | 5862 | 587 | 589 | 5906 | 5920 | 593 |  |
|  | 95 | 9592 | 9590 | 9588 | 9586 | 9584 | 9582 | 9580 | 9578 | 5.9576 | 6966 | 6983 | 70 | 7018 | 7035 | 7052 | 07 | 7087 | 04 | 7122 |  |
|  |  |  | 95 |  |  |  |  |  | 950 |  |  | 817 | 8167 | 8187 | 8207 | 8228 |  | 8268 |  | 砣 |  |
|  | 945 | 9456 | 945 | 94 | 9448 | 9445 | 9443 | 9440 | 9437 | 7.943 | 9287 | 9311 | 9334 | 93 | 9380 | 94 | 9426 | 94 | 9472 | 949 |  |
|  | 939 |  | 93 |  |  |  |  |  |  | 8.936 | 0448 | 047 | 050 | 0526 | 055 | O5 | 06 | 0630 | 0656 | 068 |  |
| 10 | 93 |  | 9317 |  |  |  |  |  |  |  |  | 163 | 16 |  | 172 | 175 | 1783 | 仡 | 40 | 186 |  |
| 11 | 256 | 925 | 924 | 9245 | 9241 | 9238 | 9234 | 9230 | 9226 | 10 | ${ }^{-2770}$ | 2802 | 2834 | 2866 | 289 | 2929 | 2961 | 2993 | 3024 |  |  |
| 12 | 9189 | 918 | 9180 | 91 | 917 | 9168 | 9164 | 9160 | 91 | 11. | ＋3931 | 396 | 400 | 40 | 4070 | 41 | 41 | 4 | 808 | 424 |  |
| 13 | 9121 |  |  |  |  |  |  |  | 90 | 129081 | 1509 | 5130 | 516 | 52 | 5242 | 52 | 53 | 53 | 93 | 543 |  |
| 1 | 9053 | 49 | 9044 |  | 9034 |  | 9025 |  | 9015 |  |  | 6293 | 633 | 63 | 641 | 645 | 6496 | 653 | 657 | 661 |  |
| 15 | 8986 | 8981 | 897 | 897 | 89 |  | 8955 | 950 | 894 | 14．8940 | 17414 | 745 | 750 | 75 | 758 | 763 | 767 | 7717 | 7761 | 780 |  |
| 16 | 89 | 8913 | 89 | 8902 | 8896 | 8891 | 8885 | 8880 | 8874 | 15 | 1.8575 | 86 | 866 | 8714 | 8760 | 880 | 8852 | 88 | 45 | 8991 |  |
|  | 885 |  |  |  |  |  |  |  |  | 16.879 |  |  |  |  | 9932 |  |  |  |  | 0178 |  |
| 18 | 878 | 877 | 877 | 8765 | 87 | 8752 | 8746 | 8740 | 8734 | $17 \cdot 87$ | 咗 | 09 | 10 | 1053 | 1105 | 1157 |  | 12 |  | 136 |  |
| 19 | 871 |  | 87 |  |  |  | 8676 |  | 8663 | 18 | 20 | 211 | 21 | 22 | 227 | 2332 | 238 | 24 | 24 | 255 |  |
| 20 | 8648 |  |  |  |  |  |  |  |  | $19 \cdot 858$ |  |  | 3334 |  |  | 3507 | 356 |  | 368 | 3739 |  |
| 21 | 8580 | 8573 | 8566 |  | 8552 |  | 8537 |  | 8523 | 20.8516 | 2.4380 | 4440 | 4501 |  |  | 4683 |  |  |  |  |  |
| 22 | 85 | 850 | 849 | 849 | 84 |  | 84 | 8460 | 8452 | 8 | 5510 | 560 | 5668 |  |  | 5858 | 5922 | 5985 | 6049 | 6112 |  |
| 23 | 84 |  | 8 |  |  |  | 83 |  |  | $22 \cdot 837$ | 670 | 67 | 683 |  |  | 703 | 71 | 716 | 7233 |  |  |
| 2 | 837 | 83 | 836 | 8353 |  |  | 28 |  | 8312 |  |  |  | 80 | 807 | 81 | 820 | 8278 | 834 | 8417 | 848 |  |
| 25 | 831 | 8301 | 8293 | 828 | 8276 | 8267 | 8259 | 8250 | 8241 | 24 | 902 | 9095 | 916 | 9240 | 931 | 938 | 945 | 952 | 960 | 967 |  |
| 26 | 82 | 8233 | 8224 | 8216 | 8207 | 8198 | 8189 | 8180 | 8171 | $25 \cdot 8162$ | 3.0184 | 0259 | 0334 | 0409 | 0485 | 0560 | 0635 | 07 | 0785 | 086 |  |
| 27 | 81 |  |  |  |  |  |  |  |  | 26.809 |  |  | 150 |  |  |  | 181 | 189 |  | 204 |  |
| 28 | 810 | 8097 | 8088 | 8078 | 8069 |  | 8050 | 8040 |  | $27 \cdot 802$ | ． 250 | 258 | 266 | 274 | 28 | 291 | 29 | 30 | 31 | 323 |  |
| 29 | 80 | 80 | 8019 | 8010 |  |  |  |  |  |  |  |  | 3835 |  |  | 408 | 41 | 425 | 43 | 442 |  |
| 30 | 79 |  |  |  |  |  | 7910 | 7900 |  | 29.787 |  | 4915 | 500 |  | 5175 | 5261 | 534 | 543 | 5521 | 560 |  |
| 31 | 790 | 7893 |  |  |  |  |  |  |  |  |  |  | 516 |  |  |  |  |  |  |  |  |
| 32 | 7836 | 78 | 7815 | 7804 | 779 | 7782 | 7771 |  | 774 |  |  |  | 733 |  |  |  | 7704 |  |  |  |  |
| 33 |  |  |  |  | 77 |  | 7701 |  |  | 3276 |  | 8 | 850 | 85 |  | 87 | 888 |  |  |  |  |
| 34 | 770 | 769 | 7678 |  |  |  |  | 7620 |  |  |  |  | 9668 | 976 | 9864 | 9963 | ＋061 | 015 | 02 | 035 |  |
| 35 | 763 | 762 | 7610 |  | 758 | 7574 | 7562 | 550 | 7538 | 34752 | ． 06 | 073 | 083 | 093 | 103 | 113 | 123 | 134 | 14 | 154 |  |
| 36 | 7566 | 7554 | 7541 | 7529 | 7517 | 7505 | 7492 | 7480 | 7468 | 35.745 | 4.179 | 1897 | 200 | 2105 | 2209 | 2313 | 2417 | 2521 | 2625 | 272 |  |
| 37 | 74 |  |  |  |  |  |  |  | 739 | 36.738 | 295 | 306 | 3168 |  |  | 3489 | 359 | 370 |  | 391 |  |
| 38 | 743 | 74 | 7405 |  | 737 | 736 |  | 7340 | 732 |  |  | 422 | 43 |  |  | 4664 | 4 | 48 | 4994 |  |  |
| 39 | 73 |  |  | 7323 |  |  |  | 7270 |  |  |  |  | 55 |  |  | 58 | 595 | 60 |  | 629 |  |
| 40 | 7295 | 7282 | 7268 | 7255 | 7241 | 7227 | 7214 | 7200 | 7186 | 39717 | 源 | 5553 | 666 | 6784 | 6899 | 701 | 13 | 724 | 7362 | 747 |  |
| 41 | 722 | 7214 |  |  | 717 |  |  |  |  |  | 598 |  |  |  |  |  |  |  |  |  |  |
| 42 | 716 |  |  |  |  |  |  |  |  | 41 |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 70 |  |  |  |  | 7019 |  |  |  | 42.69 | 4.992 |  | 01 | 0293 | 04 | 05 | 06 | 0789 | 0914 | 103 |  |
| 44 | 7025 | 10 |  | 6980 |  |  |  | 6920 |  |  | －1081 |  | 133 | 146 | 15 | 171 | 184 | 197 | 209 | 222 |  |
| 45 | 6957 | 6942 | 6927 | 6912 | 689 | 68 | 65 | 250 | 68 | 44 | 5.2242 | 23 | 250 |  |  | 289 | 302 | 315 | 228 | 341 |  |
| 46 | 68 | 6874 | 6858 | 6843 | 6827 |  | 6796 | 6780 |  | 45.6748 |  | 3536 | 366 |  |  | 4067 | 4200 |  |  |  |  |
| 47 | 68 |  |  |  |  |  |  | 6710 |  | 46.6 |  |  | 4835 |  |  | 524 | 537 | 551 | 5650 |  |  |
| 48 | 67 | 673 | 6722 | 670 | 66 |  |  | 6640 |  | $47 \cdot 66$ |  |  | 60 | 61 | 62 | 64 | 655 | 669 | 6834 |  |  |
| 49 | 66 | 66 |  |  | 662 |  |  |  |  | 48.65 | 5.68 | 702 |  | 73 |  | 75 | 773 | 787 | 80 | 815 |  |
| 50 | 66 | 6602 | 6585 | 6568 | 6551 | 6534 | 6517 | 6500 |  | 49.6466 | 5.8046 | 819 | 8335 | 8480 | 8624 | 876 | 89 | 9058 | 9202 | 934 |  |
| 51 | 65 | 653 |  | 6500 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 648 | 646 | 64 | 6431 |  |  |  |  |  | 51.63 |  |  |  |  |  |  | 1270 | 142 |  |  |  |
| 53 | 64 |  |  |  |  |  |  |  | 62 | ．62 | $6 \cdot 152$ | 16 | 1835 |  | 21 | 229 | 244 | 260 | 27 |  |  |
| 54 | 6349 | 633 | 631 | 294 | 627 | 6 | 6238 | 220 | 620 | 53 | 6.2690 | 28 | 300 | 315 | 33 | 347 | 362 | 378 | 393 |  |  |
| 55 | 6281 |  | 624 | 6225 |  |  | 61 |  | 6131 | 54 |  | 4010 | 41 |  |  |  |  | 析 | 51 |  |  |
| 56 | 62 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 |  |  |  |  |  |  |  |  |  |  | 6173 | 6338 | 6502 |  | 6832 |  | 716 |  |  |  |  |
| 58 | 60 | 605 | 6039 | 6019 | 6000 | 59 |  | 5940 |  |  | 6.733 | 75 | 76 |  | 80 |  | 833 | 85 |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  |  |  |  | 883 | 90 |  |  | 951 | 968 |  |  |  |
| 60 | 59 | 5923 | 5902 | 5882 | 5862 | 584 | 582！ | 5800 | 5779 | 59.5759 | 6.9656 | 9829 | ＋002 | 017 | 0340 | 0522 | 069 | 086 | 104 | 121 |  |
| 61 | 587 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 169 |  |  |  |  |  |
| 6 | 58 | 578 |  |  |  |  |  |  |  | 61.5 |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 57 |  |  |  |  |  | 5612 |  |  |  |  | 33 | 析 | 368 |  |  | 423 |  |  |  |  |
| 64 | 5673 | 565 | 56 | 5607 | 5586 | 55 | 5542 | 5520 | 549 | $63 \cdot 5$ | 429 | 448 | 466 | 485 | 50 | 52 | 540 | 559 |  |  |  |
| 65 | 56 |  |  | 5539 | 5517 |  | 5472 |  |  | 64.540 | $7 \cdot 5460$ |  | 58 | 6024 |  |  |  | 位 |  |  |  |
| 66 | 553 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 矿 |  | － |  | 1370 |  | 952 |  |
| 68 | 5402 | 53 | 53 | 533 | 5310 | 52 | 5263 | 5240 | 5217 | 67.5193 | 7.8963 | 91 | 933 | 953 | 97 | 992 | 12 | 031 | 05 | 071 |  |
| 69 |  | 53 |  |  | 524 |  |  | 5170 | 5146 |  |  |  | 0503 | 0702 | 901 | 121 | 1300 |  |  |  |  |
| 70 | 52 | 5243 | 5219 |  | 5172 |  | 5124 | 仡 |  | 69 | $8 \cdot 126$ |  |  | 187 | 207 | 227 | 247 | 268 | 28 | 1085 |  |
| 71 | 5132 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 513 | 5107 | 508 | 5058 | 50 | 50 | 49 | 4960 | 493 | 71.4910 | 35 | 37 | 4003 | 421 |  | 46 | 48 |  |  |  |  |
| 73 |  |  |  |  |  |  |  | 4890 | 4865 | 1 | 8.4748 | 495 | 5170 | 5381 | 359 | 58 | 601 |  |  |  |  |
| 74 | 4996 | 4971 | 4946 | 492 | 4896 | 487 | 4845 | 4820 | 4794 | 73476 | ． 5909 | 612 | 6336 | 6550 | 676 | 697 | 719 | 740 | 761 | 783 |  |
| 75 | 4929 | 4903 | 4878 | 4853 | 4827 | 480 | 4776 | 4750 | 472 | 74469 | 8707 |  | 75 | 72 | 7936 | 815 | 837 | 858 |  |  |  |
| 76 | 48 | 4835 | 4810 | 4784 | 4758 | 47 | 仡 | 4680 | 4654 | 75＇462 | 8．8231 |  | 863 | 88 | － |  |  |  |  |  |  |
| 77 |  | 4767 |  |  |  |  |  | 4610 | 4583 |  | 8．9392 | 961 | 983 | ＋ | 02 |  | 072 | 0， |  |  |  |
| 78 | 4726 | 4700 | 4673 | 4647 | 4620 | 4593 | 456 | 4540 | 4513 | 77＊448 | ． 055 | 077 | 100 | 122 | 145 | 1679 | 190 | 213 | 23 |  |  |
| 79 | 4658 | 4632 |  |  |  |  | 4497 | 4470 | 443 | 4 |  | 1942 | 2170 | 239 | 262 | 285 | 保 | 311 |  |  |  |
| 80 | 459 | 4564 | 4536 | 09 | 4482 | 445 | 4427 |  | 437 | 79．434 | $9 \cdot 287$ | 310 | 333 | 356 | 379 | 403 | 426 | 449 | 472 | 495 |  |
| 81 | 452 |  | 4468 |  | 仡 |  | 43 |  |  |  |  | 5 | 4503 | 4737 | 49 | 520 | 5 | 5673 |  |  |  |
| 82 | 445 | 442 | 440 | 43 | 434 | 43 | 428 | 4260 | 4232 | 81420 | 9.519 | 5433 | 5670 | 5907 | 61 | 63 | 66 | 68 | 709 |  |  |
| 83 | 4388 | 4， |  |  |  | 42 | 4218 |  | 4， |  | $9 \cdot 635$ |  | 683 | 707 | 硡 | 75 | 7198 | 8036 | 827 | 851 |  |
| 84 | 4320 | 4292 | 4263 | 235 | 420 | 417 | 4149 | 4120 | 409 | $83 \cdot 40$ | 975 | 776 | 800 | 82 | 84 | 87 | 8974 | 921 | 945 | 970 |  |
| 85 | 42 | 42 | 41 | 4166 | 4137 | 4108 | 4079 | 4050 | 402 | 84.399 | 9.8679 | 8925 | 9170 | 941 |  | 9907 | 115 | 039 | 0643 | 088 |  |
| 86 | 4185 | 4156 | 412 |  |  |  |  |  |  |  |  |  | 0337 | 585 |  | 硅 | 131 |  | 1827 |  |  |
| 87 | 4117 | 4，88 |  | ， | 仡 | 仡 | 3940 | 3910 | 3880 | 86.3 | $10 \cdot 10$ | 12 | 150 | 1785 | 2006 | 2258 | 2509 | 2760 |  | 326 |  |
| 88 | 4050 | 4020 | 399 | 39 | 393 | 390 | 3870 | 3840 | 381 | 87.377 | 10.216 | 24 | 2670 | 292 | 31 | 343 | 368 | 394 | 419 | 445 |  |
| 89 | 3915 |  | 3922 |  | 析 | 383 | 源 | 3770 | 矿 | 88．3709 | 10.3323 | 矿 | 383 | 409 | 435 | 46 | 486 | 5 | 538 |  |  |
| 90 | 3915 | 3884 | 3854 | 3823 | 3792 | 3762 | 3731 | 3700 | 366 | 83＇3638 | 10.4484 | 474 | 500 | 526 | 552 | 578 | 604 | 630 | 656 | 682 |  |
| 91 | 3847 | ， | 3785 | 37 | 372 | 3692 | 3661 | 3630 | 359 | $90 \cdot 356$ | 10 | 59 | 61 | 643 | 669 | 69 | 7222 | 748 | 7748 | 801 |  |
| 92 | 377 | 374 | 3717 | 36 | 3654 | 3623 | 359 | 3560 | 3528 | 91349 | 10.680 | 707 | 7337 | 7603 | 786 | 8134 | 8400 | 866 | 8932 | 910 |  |
| 93 | 371 | 880 | 析 | 3617 | 3585 | 35 | 3522 | 3490 | 345 | $92 \cdot 342$ | 10. | 82 | 8504 | 877 | 904 | 931 | 95 | 984 | ， | 587 |  |
| 94 | 3644 | 3612 | 3580 | 3548 | 351 | 34 | 3452 | 3420 | 338 | 93＇335 | 10.9127 | 93 | 9670 | 99 | ＋21 | 048 | 075 | 102 | 130 | 157 |  |
| 95 | 357 | 3544 | 3512 | 3480 | 3447 | 3415 | 3382 |  | 3317 | 94．3284 | 11.0288 | 0563 | 0837 | $11 / 2$ | 1386 | 1661 | 1935 | 2209 | 484 | 275 |  |
| 96 | 350 | 3476 | 3444 |  | 3378 |  | 3313 | 3280 | 3247 |  |  |  | 2004 | 22 |  | 2836 |  | 矿 | 3668 |  |  |
| 97 | 3441 | 3408 |  | 3343 | 退 | 3276 | 3243 | 210 | 3177 | 96 | 11.2610 | 2890 | 317 | 345 | 373 | 4011 | 429 | 457 | 485 | 513 |  |
| 98 | 337 | 3340 | 33 | 3274 | 3241 | 3207 | 3174 | 3140 | 3106 | $97 \cdot 307$ | 11.377 | 4054 | 4337 | 4620 | 4904 | 5187 | 5470 | 5753 | 6036 | 6319 | 98 |
|  | 3306 | 3272 | 3239 | 3205 | 3172 | 3138 | 104 | 307 | 3036 | 98：300 | 114932 | 5218 | 5504 | 579 | 6076 | 6362 | 664 | 693 |  |  |  |
| 100 | 3238 | 3205 | 3171 | 3137 | 3103 | 3069 | 3034 | 3000 | 2966 | 99：293 | 11.6093 | 6382 | 6671 | 6960 | 7249 | 7537 | 7826 | 8115 | 8404 | 8693 | 10 |
|  | $20^{\prime}$ | $9^{\prime}$ | 18 | 17 | $16^{\prime}$ | 15 | $14^{\prime}$ | $13^{\prime}$ | $12^{\prime}$ | $11^{1}$ | $20^{\prime}$ | $1{ }^{\prime}$ | 18 | 17 | 16 | 15 | $14^{\prime}$ | $13^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $7^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 0 | 1 | $2^{\prime}$ | 3 | ， | T |  |  | $8^{\prime}$ |  |  |  |  |  | 4 |  |  |  |  |  |  |
|  |  | 938 | 9925 | 9924 | 24 | 9924 | 923 | 9923 |  |  | 1219 | 1222 | 1224 | 1227 | 1230 | 1233 | 1236 | 1239 | 1242 | 1245 |  |
|  |  | 9850 | 9850 | 9849 | 9848 | 9847 | 9847 | 9846 | 9845 | 1．984 | 2437 | 2443 | 2449 | 2455 | 2460 | 246 | 247 | 2478 |  |  |  |
|  | 9776 | 9775 | 97 | 977 | 977 | 9771 | 9770 | 9769 | 9768 | 2.97 | ． 3656 | 3665 | 36 | 3682 | 1 |  |  |  |  |  |  |
|  | 9702 | 97 | 96 |  |  | 969 |  |  | 690 |  |  | 4886 | 4898 |  |  |  |  |  |  |  |  |
|  | 962 | 962 | 962 | － |  | 961 |  |  |  | 4.96 |  | 610 | 612 | 613 | 615 | 1 | 618 | 6195 |  |  |  |
|  | 9553 | 19551 | 9549 | 9546 | 9544 | 9542 | 9540 | ${ }^{9538}$ | ${ }^{9536}$ | $5 \cdot 9$ | 7312 | 732 | 7347 | ${ }^{736}$ | ${ }^{738}$ | 739 | 7416 | ${ }^{7433}$ | 7451 |  |  |
|  | 9478 | 9476 | 9473 | 9471 | 9468 |  | 9463 | 9461 | 9458 | 6.94 | ． 8531 | 8551 | 857 |  |  |  |  |  |  |  |  |
|  | 9404 | 94 | 93 |  |  |  |  | 9384 | 9381 | 7.9 |  | 9773 | 979 |  | 9842 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 102 | 104 | 1072 |  | 1124 | 1150 |  |  |  |
| 10 | 925 | 917 | 92 | 9244 | 9240 | 9237 | 92 | 9230 |  | 9.922 | 2187 | 22 | 2245 | 2274 | 2302 | 2331 | 2360 | 2389 | 2418 | 244 |  |
| 11 | 918 | 917 | 91 | 91 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |
| 12 | 910 |  |  |  |  |  |  |  | 907 | 1190 |  | 46 |  |  |  | 479 | 483 | 4 |  |  | 2 |
| 13 | 9031 | 9026 | 90 | 90 | 90 |  |  |  | 8994 |  |  | 588 |  | 595 | 599 | 603 | 606 | 6106 | 迷 |  | 3 |
| 14 | 895 | 8951 |  |  |  | 89 |  | 8921 | 8916 |  |  | 710 | 71 | 718 | 722 | 7264 | 730 | 7345 |  |  | 14 |
| 15 | 888 | 88 | 88 |  |  |  |  |  |  | 14 |  |  |  | 8410 |  |  |  | 858 |  |  | 15 |
| 16 | ${ }^{887}$ | ${ }^{8802}$ | ${ }^{8796}$ | 8790 | 878 |  |  | 8767 | 8762 |  | 1.9 | 19545 | 959 | 9638 | 9684 | ｜9730 | 9776 | 982 | 986 |  | 16 |
| 17 | 8733 | － | 87 | 87 |  |  |  | 8690 | 8684 |  | 2.07 |  | 0816 | 086 | 0914 | 0963 | ， |  |  |  |  |
| 18 | 8658 | 8652 | 8546 | 8639 | ${ }^{8633}$ | 8626 | 862 | 8613 | 8607 | 17. | $2 \cdot 19$ | 19 |  | 2092 | 2144 | 2196 |  |  | 2 |  | 18 |
| 19 | 8584 | 857 | 85 | 8563 |  | 8550 | 8543 | 8536 | 8529 | 18.8523 | $2 \cdot 3155$ | 32 |  | 332 | 335 | 342 | 34 | 3539 |  |  |  |
| 20 | 8509 | 8502 | 84 | － | 8481 | 8474 |  | 8459 | 18452 | 19.8445 | 24374 | 443 | 448 | 454 | 460 | 46 | 4720 | 477 | 483 |  |  |
| 21 | 8435 | ${ }_{8}^{8427}$ | ${ }^{8420} 8$ | ${ }_{8337}^{8412}$ | ${ }^{8405}$ | ${ }^{8397}$ | ${ }^{8390}$ | ${ }^{8382}$ | ${ }^{8375}$ | ${ }^{20.836}$ | 2.5593 | 565 | 57 | 577 |  | ${ }^{5896}$ |  |  |  |  | $2{ }^{21}$ |
| 22 | 8360 | 8352 | 8345 | 8337 | 83 | 8321 | 8313 | 8305 | 8297 | 21.82 | 2.68 | 687 | 69 |  |  | 7129 |  |  |  |  |  |
| 23 | 828 | 82 | 82 | 82 | 82 |  |  | 8228 | 8220 | $22 \cdot 82$ | $2 \cdot 8030$ |  | 81 |  |  | 836 | 842 | 84 |  |  | 3 |
| 24 | 821 | 82 | 8194 |  |  |  |  | 8151 |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
| 25 | 8137 | 812 | 811 | 81 | 810 |  |  |  |  |  | 3.0 | 054 |  |  |  | 10828 |  |  |  |  |  |
|  | 8062 | 805 | 80 | 80 |  | 8016 |  |  | 7988 | 25 | 3.168 |  |  |  |  |  |  |  |  |  | ${ }^{2}$ |
| 27 | 79 | 79 |  |  |  |  |  |  |  |  |  |  |  |  |  | 329 | 337 | 345 |  |  | 27 |
| 28 29 | 78 | 7903 | 7893 | ${ }_{7807}^{7883}$ | 7873 | 7863 | 7853 | 784 | 7833 |  |  | 42 | 42 | 436 | 444 | ${ }_{5761}$ | 460 | 4689 |  |  | 28 |
|  | 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\frac{30}{31}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ， |
| 32 | 7615 | 7603 | 7592 | 7581 | 75 | 75 | 754 | 753 | 7523 | 3175 | 89 | 90 | 91 |  |  |  |  |  |  |  |  |
| 33 | 7540 | 752 | 7517 | 7505 | 74 | 74 | 7470 | 7458 | 7446 | 327 | $4 \cdot 0$ | 03 |  |  |  | 069 | 0788 |  |  |  | 33 |
| 34 | 74 | 7454 | 74 |  | 74 | 740 |  | 738 | 73 | 33 | 4.14 | 15 |  | 17 |  | 192 | 202 |  |  |  | 34 |
| 35 | 739 | 7379 | 73 | 7354 | 73 | 7329 | 73 | 73 | 729 | 34727 | 4.26 | 27 | 28 | 295 | 305 | 315 | 326 | 336 | 34 |  | 35 |
| 36 | 7317 | 7304 | 7291 | ${ }_{7278}$ | 7265 | 725 | 723 | 72 | ${ }^{7214}$ | $3{ }^{35}$ | 4.388 | 3971 |  |  |  |  | 449 | 14600 |  |  |  |
| 37 | 7242 | 7229 | 7216 | 7203 | 7189 | 71 |  |  | 71 |  | －5 | 51 |  |  |  |  |  |  |  |  | 37 |
|  | 7168 | 71 |  | 71 | 71 | 710 |  |  |  | 37 | $4 \cdot 6$ |  |  |  |  |  |  |  |  |  | 38 |
| 40 | 70 |  |  |  |  | $\begin{aligned} & 702 \\ & 694 \end{aligned}$ |  | 69 | 6981 |  |  |  |  |  |  |  |  |  |  |  |  |
| 41 | 6944 | 692 | 69 |  | 68 |  |  | 684 | 682 | 40 | 4 | － |  |  |  |  |  |  |  |  |  |
|  |  | 685 | 68 | 68 | 68 | 67 |  |  |  |  |  |  | 14 |  |  |  |  |  |  |  | 42 |
| 43 | 6795 | 678 | 67 | 653 | 67 | 67 | 6703 | 688 | 667 | 42 | 5.24 | 25 | 26 |  | 2931 | 302 | 314 | 27 |  |  | 4 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4 |  | 4385 | 4512 |  |  | $4{ }^{4}$ |
| 45 | 6646 |  | 6614 | 6598 |  |  |  | 6533 |  | $44 \cdot 6501$ | 5.48 | 497 | 510 | 5 | 536 | 549 | 5621 | 575 |  |  | 45 |
| 46 | 657 | 655 | 65 | 65 | 65 | 648 | 64 | 645 | 64 | $45 \cdot 6$ | 5.60 | 619 | 632 | 645 | 65 | 672 | 16857 |  | 7122 |  | 46 |
|  | 6497 | 648 | 6463 | 6447 | 64 | 6413 |  |  |  |  |  | 74 | 75 |  |  |  | 809 |  |  |  |  |
| 48 | 6422 | 6405 | 638 | 63 | 63 | 63 |  | 6302 | 628 | 4． | 5.84 | 86 |  | ， |  |  | 9329 |  |  |  | 48 |
|  | 6348 | 63 | 63 | 62 |  | 62 | 6243 |  |  | 48.619 | 5.97 | 98 |  | 1 |  | 042 |  |  |  |  | 49 |
| 50 | 6273 | 6255 | 6238 | 6220 | 6202 | 6184 | 6166 | 6148 | 6130 | 49.611 | $6 \cdot 0935$ | 1079 | 122 | 136 | 1512 | 165 | 180 | 194 | 208 |  |  |
|  | 6199 | 6180 | 616 | 6144 | 612 | 610 | 608 |  | 60 | 50．60 | 矿 |  |  |  |  |  |  |  |  |  |  |
|  | 6124 | 610 | 60 |  | 6 | 6031 | 60 |  |  |  | 6．33 | 35 |  |  |  | 412 | 42 | 44 |  |  |  |
|  |  | 603 |  |  | 59 | 59 |  |  | 58 |  | $6 \cdot 45$ |  |  |  |  |  |  | 566 |  |  | 53 |
|  |  |  |  | 59 | 5898 | 58 |  |  |  |  |  |  |  |  |  |  | 674 |  |  |  | 54 |
| 55 | 59 | 588 | 58 | 58 | 5822 | 58 | 57 | 576 |  |  |  | 718 |  |  |  | 7822 | 7981 | 8140 |  |  |  |
| 56 |  |  | 578 |  |  |  |  |  | 5666 |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 575 |  | 57 | 56 | 56 | 56 | 56 |  | 55 |  |  | 96 |  |  |  |  |  |  |  |  |  |
| 58 | ${ }^{567}$ | 56 | 56 | 5 | 55 | 55 | 55 | 553 |  |  | 7.0684 | 085 | 101 | 1187 | 135 | 152 |  |  |  |  | 58 |
|  |  |  |  |  |  | 5497 | 5476 |  | 5 |  |  | 207 | 22 |  | 238 | 275 | 292 | 保 | 3265 |  | 5 |
| 60 | 552 | 5506 | 5485 | 54 | 5442 | 5421 | 5399 | 5378 | 5356 | 5334 | 7.3122 | 329 | 346 | 364 | 381 | 398 | 416 | 433 | 450 |  | 50 |
|  | 5453 | 5432 | 5410 | 53 | 5366 | 5344 | 532 | 53 | 52 | 60．525 | $7 \times 4340$ | 1451 | 46 |  | 150 | 52 | 53 | 557 | 574 |  | 61 |
|  |  | 535 | 53 | 53 | 529 | 52 |  | 522 | 520 | ${ }^{1}$ | 析 | 573 | 59 |  | 627 | 645 | 663 |  |  |  |  |
| 63 | 5304 | 528 | 525 | 52 | 5214 | 51 | 516 | 51 | 51 | 62.510 | $7 \cdot 677$ | 696 | 71 | 73 | 75 |  |  | 8051 | 823 |  | 63 |
|  | 5230 | 520 | 5184 | 5161 | 513 | 51 | 5 | 506 | 50 | 63.50 | 5 | 818 | 83 | 855 |  | 892 | 910 | 9290 | 947 |  | 4 |
| 65 | 5155 | 5132 | 5109 | 50 | 5062 | 5039 | 5016 | 4992 | 496 | 6442 | 7.9215 | 940 | 95 | 977 | 996 | 15 | 034 | 05 | 276 |  | 5 |
| 66 | 508 | 5057 | 5034 | 5010 | 4986 | 4963 | 4939 | 4915 | 489 | 65 | 8 | 062 | 08 | 10 |  |  |  |  |  |  |  |
|  | 5006 | 498 | 49 | 493 | 49 | 4886 | 486 | 483 | 481 |  | 8.1 | 184 | 20 |  |  | 26 | 28 |  |  |  | 67 |
|  |  |  |  |  | 通 | 48 |  |  | 4737 |  |  |  | 32 |  |  |  |  |  | 44 |  | 68 |
| 69 | 485 | 4832 | 48 | 478 |  | 473 |  |  |  |  |  |  |  |  |  |  | 528: | $548 .$ |  |  | 69 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4 | 46 | 45 | 45 | 45 | 45 | 447 | 44 | 44 |  |  | 795 | 81 |  |  | 878 |  |  |  |  | 72 |
| 7 | 455 | 45 | 45 | 44 | 44 | 4429 | 4402 | 43 | 43 |  | 8.896 | 917 | 938 | 959 | 9808 | 401 | 0229 | 044 | d |  | 3 |
| 74 | 448 | 4 | 44 |  |  | 435 | 研 |  |  |  | 9.0183 | 039 | ， | 082 | 103 | 125 | 146 |  | 1892 |  |  |
| 75 | 441 | 4383 |  | 433 | 4303 | 42 | 42 | 4222 | 4195 | 74.416 | 9．1402 | 161 | 1835 | 2052 | 226 | 248 | 270 | 291 | 3134 |  | 75 |
|  | 4335 | ${ }^{4308}$ | 4281 | 4254 | 4227 | 42 | 417 | ， | 4118 | 75．40 | 9．2621 | 28 | 30 | 32 | 34 | 37 |  |  | 14376 |  | 76 |
| 77 | 4261 | 4233 | 4206 | 4178 | 415 | 4123 | 409 | 406 | 40 | 76．40 | 9.383 | 406 | 42 | 45 | 47 | 4 |  |  |  |  | 77 |
| 78 | 4181 | 4158 | 4131 | 418 | 40 | 4047 | 401 | 399 | 396 | 77－39 | $9 \cdot 50$ | 528 | 55 | 57 | 595 | 618 | 640 | 663 | 685 |  | 78 |
| 79 |  | 4083 |  |  |  | 3971 | 394 | 391 | 388 |  | 627 | 650 | 673 | 69 | 718 |  |  |  |  |  | 79 |
| 80 | 4037 | 4009 | 3980 | 3952 | 3923 | 3894 | 386 | 3837 | 3808 | 79.377 | 9.7495 | 772 | 795 | 818 | 841 | 865 | 888 | 911 | 9343 | 9574 | 30 |
| 81 | 39 | 393 | 3905 | 3876 | 387 |  | 㤑 | 37 | 373 | 8037 | 87 | 894 | 9 | 94 | 965 | 98 | ${ }^{-117}$ |  | 0585 |  |  |
|  | 388 | 385 | 3830 | 3800 | 377 | 37 | 37 | 368 | 365 | 8136 | 9.993 | ＋17 | 04 |  | 088 | 11 | 135 |  | 182 |  |  |
|  |  | 37 | 375 | 372 | 369 |  | 363 | 36 | 3576 |  | $10 \cdot 1$ |  | 16 |  |  |  |  | 282 | 306 |  | 83 |
|  |  | 37 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 | 3664 | 3634 |  |  |  | 3513 | 348 | 345 | 34 | 84.33 | 10 | 383 | 408 | 4325 | 4570 |  |  | 5307 | 5552 |  |  |
|  | 3590 | 355 | 3529 | 3498 | 3467 |  | 340 | 337 | 3344 |  | 10 | 50 | 53 | 55 | 58 | 60 | 629 | 65 |  |  | 86 |
|  | 351 | 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 344 | 3439 | ${ }_{3303}^{338}$ |  | 3315 |  | 325 |  | 3189 <br> 311 |  | 10.72 | 872 | 77 | 92 | 826 |  |  |  |  | 953 | 88 |
| 90 | 3292 | 3260 | 3228 | 3195 | 3163 | 3131 | 3099 | 3066 | 3034 | 89：3001 | 10．9682 | 9942 | ＋202 | 046 | 0722 | 098 | 124 | 1501 | 176 | 202 | 89 <br> 90 <br> 8 |
| 91 | 3217 | ${ }^{31}$ | 31 | 3120 | 30 | 3055 | 3022 | 298 | 29 | 90.29 | 11.0901 | 116 | 142 | 168 | 195 | 22 | 247 | 2740 | 13003 |  | 91 |
| 92 | 3143 | 31 | 307 | 3044 | 30 | 2978 | 2945 | 2912 | 287 | 91 | 11.2 | 238 | 26 | 29 | 31 | 34 | 371 |  |  |  |  |
|  |  | 303 | 3002 | 29 | 2935 | 290 | 289 | ${ }^{283}$ | 280 | 92．27 | 11.3338 | 360 |  | 414 | 44 | 468 | 494 | 5218 | 5486 |  | 93 |
|  |  |  | 2851 | 2893 | 2785 | ${ }_{2750}^{2826}$ | 2715 | ${ }_{268}^{275}$ | 264 | 93.2690 94.261 | 111.4577 | ${ }_{6}^{482}$ | 510 | 55 | 56 | 714 | ${ }^{618}$ | 769 |  |  | 94 |
| 95 | 291 | 2885 |  |  |  |  |  |  |  |  | 11.5776 |  |  |  | 687 |  |  |  |  |  |  |
|  | 27 |  | 2701 |  | 2632 | 2597 | 2562 | 252 | 249 | ${ }^{95}$ | 111．8929 |  |  | ${ }_{905}^{782}$ | 818 |  |  |  |  |  |  |
| 9 |  | 266 | 2626 | 2591 | 2556 | 2521 | 256 | 245 | 241 | 97：237 | 11.943 | 971 |  | ${ }^{28}$ | 056 |  |  |  |  | 197 |  |
|  |  |  | 2550 |  | 248 | 244 |  | 23 |  |  |  |  |  |  | 179 |  |  |  |  |  | 99 |
|  | 2546 | 251 | 2475 | 239 |  | 2368 | 2331 | 296 | 2260 | 99．2224 | 12.1869 | 2158 | 2447 | 2736 | 302 | 331 |  | 889 | 4179 |  |  |
|  | $60^{\prime}$ | $59^{\prime}$ | 58 | $57^{\prime}$ | $56^{\prime}$ | $55^{\prime}$ | 54＇ | $53^{\prime}$ | $52^{\prime}$｜ | 51 | $60^{\prime}$ |  | $58^{\prime}$ | 57＇ | 56 | 65 | $54^{\prime}$ | $63^{\prime}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $82^{\circ}$ |

TRAVERSE TABLES．

|  | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $7^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | $13^{\prime}$ | $1{ }^{\prime}$ | 15 | $16^{\prime}$ | 17＇ | $18^{\prime}$ | 19 | $1{ }^{\prime}$ | $1{ }^{\prime}$ | 12 | 13 | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ | $17^{\prime}$ | $18^{\prime}$ |  |  |
|  | 9922 | 99 |  |  | 9920 | 9920 |  | 9919 |  | 9919 | 12 | 1250 | 1253 | 1256 | 1259 | 1262 | 5 | 1268 | 1271 | 1274 |  |
|  | 9844 | 9843 | 9842 |  | 984 | 98 |  | 983 |  | －983 | 2495 | 25 | 25 | 25 | 25 | 2524 | 2530 | 253 | 2541 |  |  |
|  | 39766 | 9765 | 9763 | 9762 | 9761 | 976 | 975 | 975 | 97 | $2 \cdot 975$ | 37 | 375 | 376 | 37 | 3777 | 37 | 37 | 3803 | 3812 | 3821 |  |
|  | 9687 |  |  |  |  |  |  | 9677 | 㖪 | 3.96 | 4990 | 500 | 50 | 50 | 503 | 5048 | 5060 | 507 | 5083 | 5094 |  |
|  | 609 | 9608 | 9606 | 9604 |  |  |  |  |  | 4.95 | 6238 | 625 | 62 | 62 | 6296 | 6310 | 6324 | 633 | 6353 | 6368 |  |
|  | 69531 | 95 | 95 | 9525 | 9522 | 9520 | 9518 | ｜9516 | 9514 | 5.9511 | 7485 |  | 7520 | 753 | 755 |  | 7589 | 7607 |  |  |  |
|  | 79453 | 94 | 94 |  | 9443 | 9440 | 9438 | 94 | 9433 | 6.943 | 8733 | 87 | 8773 | 8794 | 8814 | 8834 | 8854 | 8874 | 8895 |  |  |
|  | 937 | 937 | 93 |  |  |  |  | 9355 |  | 7.934 | 9980 | －00 | 002 | 003 | － | 009 | 0119 | 0142 | 016 | 018 |  |
|  | 99297 | 9294 | 929 |  | 9284 | 9280 | 9277 | 9274 | 9270 | 8.926 | $\cdot 122$ | 125 | 128 | 130 | 133 | 135 | 1384 | 141 | 1436 | 1462 |  |
|  | 09219 | 9215 |  |  | 04 | 9200 | 97 | 93 | 9189 | 9.9186 | $1 \cdot 2476$ | 2504 | 2533 | 256 | 259 | 26 | 26 | 267 | 2706 | 2735 | 10 |
|  | 91 | 91 | 9133 |  |  |  |  |  |  | 10 | 23 | 375 | 3787 | 381 | 38 | 3882 | 391 | ${ }^{3945}$ | 3977 | 400 | 11 |
|  | 906 | 905 | 90 |  | 9045 | 9041 | 90 | 9032 |  |  | －4971 | 5005 | 5040 | 5075 |  | 5144 | 919 | 213 | 524 |  |  |
|  | S | 8980 | 897 | 8970 |  | 8961 | 895 | 8951 | 89 | 12.894 | －6218 | 62 | 62 | 63 | 6368 | 6406 | 64 | 64 | 65 |  |  |
|  | 8906 | 8901 | 88 |  | 88 | 88 | 887 | 8870 |  | 13.88 | $\cdot 7466$ | 7506 | 754 | 75 |  | 76 | 7708 | 774 | 7789 |  |  |
|  | 8828 | 8823 | 8817 | 8812 |  | 8801 | 879 | 8790 | 8784 | 14.8779 | －8713 | 8757 | 8800 | 884 | 888 | 903 | 8973 | 9016 | 9060 | 91 | 15 |
|  | 875 | 87 | 8738 | 8733 | 8727 | 8721 | 8715 | 8709 | 8703 | 15.869 | 1.9961 | 007 | 0053 | 0099 | 014 | 0192 | 0238 | 10284 |  |  | 16 |
|  | 867 |  |  |  |  |  | 8635 |  |  |  |  |  | 130 | 13 |  | 145 | 1503 | 1552 | 1601 |  | 17 |
|  | 8594 | 8587 | 85 | 85 | 8567 | 8561 | 85 | 85 |  | 17.8 | 2.2456 | 25 | 25 | 261 |  | 2716 | 2768 | 282 | 287 | 292 | 18 |
|  | 851 | 85 |  |  |  | 8481 | 84 | 84 |  | 18.8453 | 2 | 3758 | 3813 | 3868 | 3923 | 3978 | 40 | 08 | 4142 | 419 | 19 |
| 20 | 8437 | 8430 |  |  |  | 01 |  | 8386 |  | $19 \cdot 837$ | $2 \cdot 49$ | 5009 | 506 | 51 | 5182 | 52 | 5298 | 5355 | 41 | 547 | 20 |
| 21 | 835 | 8352 | 8344 | 8336 | 8329 | 8321 | 8313 | 8306 |  |  |  |  |  |  |  |  | 6562 | 6623 | 668 | 674 | 1 |
| 22 | 82 | 8273 | 82 | 82 | 82 | 824 | 82 | 822 | 8217 | 21.82 |  |  | 757 |  |  |  |  | 7891 |  |  |  |
| 23 | 8203 | 8195 | 8186 | 81 | 81 | 8161 | 8153 | 8144 | 8136 | 22 | 2 | 87 | 88 | 88 | 89 | 90 | 90 | 91 | 92 | 929 | 23 |
| 24 | 8125 | 8116 | 8108 | 80 | 8090 | 8081 |  | 8064 |  | 23 |  | － | 00 | 01 | 02 |  | 03 | 0426 | 049 |  |  |
| 25 | 258047 | 8038 |  |  | 8010 |  | 79 | 79 | 7974 | $24 \cdot 7964$ | $3 \cdot 1189$ | 126 | 133 | 140 | 147 |  |  |  | 1766 |  |  |
| 26 | 267969 | 7959 | 7950 | 7940 | 7931 | 7921 | 7912 | ｜7902 | 7893 | $25 \cdot 7883$ | 3.2437 | 2512 | 2587 | 2662 | 2737 | 2812 | 2887 | 2962 | 3037 | 311 | 26 |
| 27 | 789 |  |  |  |  |  |  |  | 781 | 26.780 | 36 | 37 | 3840 |  |  |  |  |  | 430 |  |  |
| 28 | 7812 | 02 | 7792 | 778 | 7772 | 7761 | 7751 | 7741 | 7730 | $27 \cdot 772$ |  |  | 5093 |  |  | 5336 | 5417 | 5497 |  |  |  |
| 29 |  |  |  | 7703 |  |  | 7671 |  |  | 28.763 |  | 626 | 6347 | 643 | 65 | 65 | 668 | 676 | 684 | 693 |  |
| 30 | 0765 |  |  | 7623 |  |  | 7590 | 757 |  | 55 | $3 \cdot 7427$ | 7513 | 7600 | 768 | 777 | 7860 | 794 | 803 | 81 | 20 | 30 |
| 31 | 757 | 756 | 755 | 754 | 7533 | 7522 | 7510 | 7499 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 7500 | 7488 | 7477 | 74 | 74 | 7442 | 7430 | 7418 | 740 | 31.73 | －9922 | ＋ | 010 |  |  |  |  |  |  |  |  |
| 33 | 7422 | 7331 |  | 7386 | 737 |  | 7350 |  |  | 32. | －11 | 12 | 1360 | 14 |  | 16 | 174 | 1836 | 1931 | 202 |  |
| 34 | 7344 | 7331 | 19 | 7307 | 729 |  | 7269 | 72 |  | 33 | ， | 25 | 261 | 27 |  | 29 | 3006 | 3104 | 3202 |  |  |
| 35 | 57266 | 7253 | 7240 | 7227 | 7215 |  | 7189 | 71 | 71 | 34. | 36 | 376 | 386 | 39 | ¢ | 417 | 4271 | 4372 | 447 | 4574 |  |
| 36 | 718 | 7174 | 7161 | 714 |  |  | 7109 | 7095 | 7082 | $35 \cdot 7$ | 4.4912 | 5016 | 5120 | 5224 | 5328 | 54 | 5536 | $\mid 5639$ | 5743 | 584 | 36 |
| 37 | 710 | 7017 | 7082 | 70 |  |  |  | 7015 |  | 36.698 |  |  | 637 |  |  | 66 |  | 69 |  |  |  |
| 38 | 703 | 7017 |  | 69 | 6976 | 6962 | 69 | 69 | 692 |  |  |  | 76 | 773 | 784 | 79 | 80 | 817 | 828 |  |  |
| 39 | 6953 | 9017 |  | 6910 |  |  | 68 | 68 | 68 | 38.68 |  |  | 888 | 899 | 910 | 92 | 933 | 94 | 255 |  |  |
| 40 | 6875 |  |  | 6831 |  |  | 6787 | 677 | 6758 | 39．674 | 4.9902 | 4018 | 0133 | 0249 | 0364 | 0480 | 0595 | 071 | O2 |  | 40 |
| 41 | 67 | 6782 | 6767 | 675 | 657 | 6722 | 6707 | 6692 | 6 | 40 | $5 \cdot 115$ |  | 138 |  |  |  |  |  |  |  |  |
| 42 | 671 |  | 6688 | 667 | 66 | 66 | 6627 | 6611 | 65 | 41 |  |  | 26 |  |  | 30 |  |  |  |  | 42 |
| 43 | 6641 | 6625 | 6609 | 659 | 657 | 6562 | 546 | 6531 | 65 | $42 \cdot 6$ | 5.364 |  | 38 | 40 |  | 426 | 439 | 451 | 46 | 476 | 43 |
| 44 | 6562 | 6546 | 6530 | 65 | 649 | 6482 | 6466 | 6450 | 643 | 43 |  | 502 | 51 | 527 |  | 552 | 565 | 578 |  |  |  |
| 45 | 56484 |  | 6452 | 6435 | 64 | 6402 | 63 | 析 | 63 | 44. | 5.6140 | 527 | 6 | 653 |  | 579 |  |  | 7179 | 730 | 45 |
|  | 64 |  |  | 635 |  |  |  | 6288 | 6271 | 45.625 | 57388 |  | 7653 | 7786 | 7919 |  |  |  |  |  | 46 |
| 47 | 632 |  | 6294 | 627 | 6260 | 62 | 6225 | 6208 |  | 46.617 | 5.86 |  |  | 904 | 9178 | 9314 |  |  | 972 |  |  |
| 48 | 62 | 6233 | 6215 | 619 | 6180 | 61 | 6145 | 612 | 610 | 47 |  | ${ }^{1} 2$ | 016 | 02 | 043 | 05 | 071 | 085 | 099 | 12 | 48 |
| 49 | 617 | 6154 | 6136 | 1 |  |  | 6064 | 6046 | 6028 | 48.60 | 6.1130 |  | 141 | 155 | 169 | 183 |  | 212 | 226 |  |  |
| 50 | 609 |  | ， 57 | 039 | 6021 | 6002 | 5984 | 5966 | 5947 | 49．5929 | 6.2378 | 2522 | 2667 | 2811 | 2955 | 3100 | 3244 | 3388 | 3532 | 367 | 50 |
| 51 | 16016 |  | 5978 |  |  | 59 | 5904 | 5885 | 586 | 50.584 |  |  |  |  |  |  |  |  |  |  | 51 |
|  | 593 |  |  | 5881 | 5862 | 58 | 5823 |  | 578 |  |  |  |  |  |  |  |  |  |  |  | 52 |
| 53 | 585 | 57 | 5821 | 580 | 5782 | 57 | 5743 | 24 | 57 | 52. | 6.6121 | 62 |  |  | 67 | 68 |  | 719 | 734 |  |  |
| 5 | 578 | 57 | 5742 | 572 |  |  |  | 56 | 56 |  |  |  |  |  | 799 | 81 | 830 | 845 | 861 | 877 |  |
| 55 | 57 | 5683 | 5663 | 543 |  | 56 | 5583 | 5562 | 55 | 54 | 6.8616 |  |  | 909 | 9251 | 940 | 95 | 9727 | 988 | d7 |  |
| 56 | 56525 | 5605 | 5584 | 5564 |  | 5523 |  | 5482 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 55 | 55 | 55 | 5485 |  | 54 | 5422 | 5401 | 5380 | 56.53 |  |  |  |  |  | 1933 |  | 226 |  |  |  |
|  |  |  | 54 | 5405 |  | 53 |  | 532 | 529 | 57.5277 |  | 25 |  |  | 30 | 3195 |  | 35 | 369 |  |  |
| 59 | 5391 | 5369 | 5348 | 326 |  | 5283 | 5261 | 5240 | 5218 | 58.519 |  |  |  | 411 | 428 | 115 | 463 | 47 | 49 |  |  |
| 60 | 5312 | 52 | 526 | 5247 | 5225 | 5203 | 5181 | 59 | 5137 | 59 | 74854 |  | 520 | 5373 | 5546 | 571 | 5893 | 606 | 623 | 641 | 60 |
| 61 |  |  | 5190 | 5168 |  | 51 | 510 | 507 | 505 | $60 \cdot 503$ |  |  |  | 66 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 499 | 497 | 咗 |  |  |  |  |  |  | 84 |  |  |  |  |
| 63 | 507 | 50 | 5032 | 5009 | 49 | 49 | 49 | 4917 | 4893 | 487 |  |  |  | 914 |  |  |  |  | t05 |  |  |
| 64 |  |  |  | 493 | 49 | 48 |  | 4836 | 481 | 63.478 |  | －02 | 02 | 03 | 058 | 07 | 09 | 113 | 132 | 150 |  |
| 65 | 49 | 4898 |  | 4851 | 4827 |  |  |  | 4731 | 64：470 |  |  |  | 16 | 1842 | 202 | 22 | 240 | 1392 |  | 65 |
| 66 | 484 | 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 476 | 47 | 471 | 469 | 466 | 464 | 46 | 4594 | 456 | 6.45 | ． 35 |  |  | 41 | 436 | 45 | 47 | 494 | 51 |  |  |
|  |  |  |  |  |  |  |  | 4513 | 4488 | $67 \cdot 446$ | 8483 | 50 | 522 | 54 | 561 | S8 | 60 | 62 |  |  |  |
| 69 | 460 | 458 | 4559 | 4534 | 45 | 4483 | 4458 | 4433 | 4407 |  |  | － |  |  | 67 |  |  |  |  |  |  |
| 70 | 4531 | 45 | 4480 | 4455 | 44 | 4403 | 43 | 4352 | 4326 | 69.430 | $8 \cdot 7329$ | 75 | 773 | 793 | 813 | 833 | 854 | 874 | 89 | 14 | 70 |
| 71 |  |  |  |  | 4270 | 43 | 4297 | 427 | 4245 | 70.42 | － |  |  |  |  |  | 980 | ． 017 | 218 |  |  |
| 72 | 437 | 43 | 432 | 4296 | 427 |  | 4 | 4191 | 4164 |  | 982 | ＊03 |  |  |  | 086 |  | 127 | 275 |  | 72 |
| 73 | 429 | 427 | 424 | 4217 | 4190 | 4164 | 4137 | 4110 | 4083 | $72 \cdot 405$ | － | 1283 | 149 | 170 | 191 | 212 | 233 | 254 | 275 | 2968 | 73 |
| 74 | 位 |  |  | 41 | 4 | 4084 |  | 4029 | 4002 | $73 \cdot 397$ |  | 253 | 2747 | 296 | 3174 | 338 | 360 | 381 | 402 | 424 | 74 |
| 75 | 414 | 4113 | 4086 | 4059 | 4031 | 400 | 397 | 394 | 392 | 389 |  |  |  |  |  | 4649 |  |  |  |  | 75 |
| 76 | 406 | 4035 | 40 | 3979 | 3952 | 3924 | 3896 |  |  |  |  |  |  |  |  | ， |  |  |  |  | 76 |
| 77 | 39 | 3956 | 3928 | 390 | 3872 | 38 | 38 | 378 | 375 | 76．373 | $9 \cdot 606$ | 628 | 650 | 672 | 695 | 717 | 739 | 761 | 784 | 806 | 77 |
| 78 | 390 | 387 | 384 | 38 | 3792 |  | 3735 | 析 | 3 | 77－364 | 9.7310 | 7535 | 7760 | 798 | 8210 | 843 | 866 | 888 | 倍 | 933 | 78 |
| 79 | 382 | 379 | 3771 | 3742 | 3713 | 3684 | 3655 | 3626 | 3597 | 78.356 | $9 \cdot 85$ | 878 | 9013 | 924 | 9469 | 969 | 9925 | ＋153 | 038 | 060 | 79 |
| 80 | 3750 | 37 | 3692 |  | 373 | 3604 | 3575 | 3545 | 3516 | 79.3486 | 9.980 | ＋036 | 026 | 049 | 072 | 095 | 119 | 142 | 1652 | 188 | 80 |
| 81 |  | 3642 | 353 |  | 3554 | 33 | 硣 | 3464 | 343 | 80．340 | $10 \cdot 10$ | 128 | 1520 | 1754 |  | 222 | 245 | 268 | 292 |  |  |
| 82 | 3594 | 3564 | 3534 | 3504 | 仡 | 34 | 34 | 3384 | 3353 |  |  | 237 | 2773 | 301 | 3247 | 348 |  | 52 |  | 4830 |  |
| 83 | 3516 | 3485 | 3455 | 3425 | 3395 | 336 | 3334 | 3303 | 3272 | 82．3242 | 10.354 | 378 | 4027 | 4266 | 4506 | 474 | 498 | 5224 | 5464 |  |  |
| 84 | 3437 | 3407 | 3376 | 3346 | 3315 |  | 3253 | 3222 | 3191 | －2 | 10.47 | 503 | 5280 | 552 | 5765 | 600 | 25 | 649 | 5734 |  | 84 |
| 85 | 335 | 332 | 3297 | 326 | 3235 | 204 |  |  | 311 | 84 | 10.60 |  |  |  |  |  |  |  | 80 | 硡 |  |
| 86 | 32 | 325 | 3219 | 31 | 3156 | 3124 | 3093 | 306 |  | B5 |  | 538 |  | 803 |  | 85 | 879 | 227 | 927 |  | 86 |
| 87 | 2203 | 3171 | 3140 | 3108 | 3076 | 3044 | 3012 | 2980 | 2948 | 86.2916 | 10.85 | 878 | 90 | 92 | 9542 | 979 | ＋04 | 029 | 05 |  |  |
| 88 | 312 | 3093 | 30 |  | 2997 | 28 | 2932 |  | 2867 | 83 |  | －1039 | 029 | O54 | O80 | 105 | 1309 | 156 | 81 | 207 | 88 |
| 89 | 30 | 3014 | 2982 | 2950 | 2917 | 288 | 2852 | 2819 | 2786 | 88.2753 | $11 \cdot 103$ | 1290 | 154 | 180 | 206 | 231 | 2574 | 283 | 30 | 3 | 89 |
| 90 | 2969 | 2936 |  | 2870 | 2837 | 2804 | 2771 | 2738 | 2705 | 89.2672 | 11.2280 | 254 | 280 | 30 | 33 | 357 | 383 | 409 | 4358 | 461 | 90 |
| 91 | 281 | 2858 | 224 |  |  |  |  |  | 2624 |  |  | 391 | 405 | 431 | 45 | 484 | 5 | 56 |  |  |  |
| 92 | 281 | 277 | 2746 | 2712 | 26 | 2645 | 2611 | 2577 | 543 | 2509 | 11.477 | 5041 | 535 | 5572 | 5838 | 6103 | 636 | 6634 | 889 | 寿 | 92 |
| 93 | 273 | 2701 | 266 |  | 2599 | 2565 | 2530 | 2496 | 2462 | 92．242 | 11.602 | 629 | 656 | 6828 | 7097 | 7365 | 7633 | 790 | 8170 | 84 | 93 |
| 94 | 265 | 2622 | 25 | 2554 | 2519 | 2485 | 2450 | 2416 | 2381 | 93.2346 | 11.7271 | 7542 | 7813 | 808 | 8356 | 86 | 8898 | 917 | 944 | 971 |  |
| 95 | 257 | 2544 | 2509 | 253 | 2440 | 2405 | 2370 | 2335 | 2300 | 94：2265 | 11.8518 | 879 | 807 | 934 | 9615 | 9889 | ＋163 | 0437 | 07 | 098 | 55 |
| 96 | 2500 | 2465 | 2430 |  | 2360 | 2325 | 2289 | 2254 | 2219 | $95 \cdot 2183$ | 11.976 | 1043 | 0320 | 059 | 0874 | 115 | 1428 | 70 | 198 | 225 | 96 |
| 97 | 242 | 238 | 2351 | 223 | 22 | 2245 | 2209 | 2173 | 2138 | 96.2102 | $12 \cdot 101$ | 1293 | 1573 | 1853 | 2133 | 241 | 2693 | 297 | 325 | 353 | 97 |
| 98 | 23 | 230 | 2272 | 2237 | 2201 | 2165 | 21 | 2093 | 2057 | 97－2020 | 12.2261 | 2544 | 2827 | 3109 | 3392 | 367 | 3958 | 424 | 452 | 4806 | 98 |
|  |  | 230 | 2194 | 2157 | 2121 | 2085 | 仡 | 2012 | 1975 | 98．1939 | $12 \cdot 3508$ | 3794 | 4080 | 4366 | 4651 | 4937 | 5223 | 5508 | S7 | 60 | 99 |
| 100 | 2187 | 2151 | 2115 | 2078 | 2042 | 2005 | 1968 | 1931 | 894 | $99 \cdot 1857$ | 12.475 | 5045 | 5333 | 5622 | 5910 | 6199 | 488 | 6776 | 06 |  | 100 |
|  | $50^{\prime}$ | 49 | 48 | 47 | 46 | 45 | 44 | $43^{\prime}$ |  | $41^{\prime}$ | （ ${ }^{\prime}$ |  | $4^{\prime \prime}$ | 47 | $46^{\prime}$ | $45^{\prime}$ |  |  |  |  |  |
| 82 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | NE |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.

|  | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $7^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 1 | 42 | $43^{\prime}$ | $44^{\prime}$ | \| $45^{\prime}$ |  |  |  |  | 40 | 41' | $42^{\prime}$ |  | ' |  |  |  |  |  |  |
|  | 9911 | 991 | 991 | 9909 | 990 | 9909 | 9908 | 9908 | 9907 | 907 | 1334 | 1337 | 1340 | 1343 | 46 | 1349 | 351 |  |  |  |  |
|  |  | 982 | 982 | 98 | 98 | 9817 | 9817 | 98 |  |  | , | 267 |  |  |  |  |  |  |  |  |  |
|  |  | 97 |  |  |  | 97 |  |  |  |  |  | 40 |  |  |  |  | 54 |  | 1 |  |  |
|  |  | 981 |  |  |  | 9635 |  | 9631 |  |  |  |  |  |  |  |  | 5406 | 4417 | 4529 |  |  |
|  | 5.9553 | 95 |  |  |  |  |  | 9539 | ${ }^{53}$ | $4 \cdot 953$ |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 946 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8108 | 8126 | 8143 | 18160 |  |
|  |  | 92 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9480 | 0 |  |  |
|  | 9285 | 9282 | 9279 |  |  | 92 |  |  |  | 7.925 | 1.0673 | 06 | 071 | 07 | 0765 | 0788 | 0811 | 0834 | 7 |  |  |
|  | 99195 | 9192 | 9188 | 9185 |  | 9178 | 9174 |  | 9167 |  | 1.2007 | 20 | 2059 | 2085 | 2111 | 2137 | 2163 | 98 | 14 |  |  |
| 10 | 19106 | 9102 |  | 9094 |  |  |  |  | 75 | 9.9071 | 3341 | 3370 | 3399 | 342 | 3456 | 3485 | 35 | 3543 | 72 |  |  |
| 11 | 19017 | 9012 | 9008 | 9004 | 90 | 89 | 8991 | 8997 | 8982 | 10.8 | . 46 | 4707 | 4738 | 4770 | 4802 | 483 | 486 | 4897 | 14929 |  |  |
| 12 |  | 892 | 8918 | 8913 |  | 89 | 88 | 8894 | 889 | 11.8 | . 60 | 6044 | 6078 | 6113 | 6148 | 92 | 6217 | 51 | 86 |  |  |
| 13 | 138838 | 88 | 88 | 88 | 88 | 8813 | 88 |  |  | 12.87 | 173 | 738 | 7418 | 74 | 7493 | 31 | 756 |  |  |  | 3 |
| 14 | 487 | 87 | 87 | 87 | 87 | 8721 | 8716 | 8 | 8705 | $13 \cdot 86$ |  | 871 | 875 | 87 |  |  |  |  |  |  | 4 |
| 15 | 58659 | 86 | 864 | 86 | 8636 | 8630 | 8624 | 8618 | 8612 | 14 | 2.00 | 005 | 009 | 01 | 0184 | 0228 | 0271 | 0314 | 0357 |  | 5 |
| 16 | 85 | 85 |  | 85 | 8545 | 85 | 853 | ¢ | 8520 | 15.8 | $2 \cdot 13$ | 27 |  |  |  |  |  |  |  |  |  |
| 17 | 78480 | 84 | 8467 |  | 84 | 8447 | 84 | 84 | 8427 | 16 |  | 27 | 27 |  |  |  |  |  |  |  |  |
| 18 |  | 83 |  |  |  | 8356 | 8349 |  | 8335 |  |  | 406 | 41 | 4 | 4 | 427 | 4325 | 4377 | 442 |  | 8 |
| 19 |  | 8294 |  |  |  |  |  |  |  |  |  |  |  |  |  | 5622 | 5676 | 573 |  |  | 19 |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 |  |  |  | 8098 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |
| 22 |  | 80 |  |  |  |  |  |  | 7965 |  |  | 9414 |  |  |  |  | 9731 |  |  |  |  |
| 23 | 79 |  | 79 | 791 | 79 |  | 78 |  |  | $22^{2}$ |  |  |  |  |  | 1016 | 1082 |  | 1215 |  | 23 |
| 24 | 785 | 78 | 78 |  |  |  | 7798 |  |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
| 25 | 5776 | 775 | 774 | 773 | 772 |  | 7707 |  |  | 24.767 | . 33 | 3424 |  |  | 3641 | 37 | 3785 | 3857 |  |  | 25 |
| 26 | 7676 | 766 | 7656 | 7645 | 7635 | 7625 | 7615 | 7605 | 7594 |  | 3.4686 | 476 | 483 | 49 |  | 5061 | 5136 |  |  |  | 26 |
| 27 | 7586 | 757 | 756 | 7555 | 7544 | 7534 | 7523 | 7513 | 7502 | $26 \cdot 7$ |  |  |  | 62 |  |  |  |  |  |  |  |
| 28 |  | 74 | 74 | 74 | 74 | 74 | 7431 | 7420 | 7409 | 27 | $3 \cdot 7355$ | 7435 | 751 |  |  | 7758 |  |  |  |  | 28 |
| 29 |  | 739 |  |  | 7362 |  | 7340 | 7328 | 7317 |  |  |  |  |  |  |  |  |  |  |  | 29 |
| 30 | 731 | 730 | 729 | 72 | 7272 | 7260 | 7248 | 7236 | 224 | $29 \cdot 721$ | 4.0023 | 010 | 0196 | 028 | 0369 | 045 | 054 | 0628 | 07 |  | 30 |
|  |  | 7217 | 720 | 719 |  | 71 |  |  |  |  | 4.1357 |  |  |  |  |  |  |  |  |  |  |
| $32$ |  | 71 | 7115 | 7102 | 7090 | 70 | 7065 |  |  | 31 | 4.26 | 278 | 287 |  |  |  |  |  |  |  |  |
| $33$ |  | 703 | 70 | 70 | 6999 | 6986 |  | 6960 | 6947 |  | $4 \cdot 40$ | 412 |  | 431 | 440 | 45 | 45 | 4691 |  |  | 33 |
| 34 | 69 | 69 | 6a |  |  |  |  | 6868 | 685 |  |  |  |  |  |  |  | 594 |  |  |  | 34 |
| 35 | 687 | 68 |  | 6830 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 36 | 6782 | 676 | 6754 | 6740 | 6726 | 6712 |  |  | 667 |  |  |  | 823 | 833 | 844 | 854 | 1865 | 8754 | ${ }^{8858}$ |  | 36 |
| 37 | 66 |  |  |  | 6635 |  |  |  |  |  |  |  |  |  |  |  | -00 |  |  |  | 37 38 38 |
| $\left.\begin{gathered} 38 \\ 30 \end{gathered} \right\rvert\,$ |  |  |  |  |  | ${ }_{6438}^{6529}$ |  |  |  |  |  |  | 225 |  |  |  |  |  |  |  | 39 |
| 4 | 642 | 6409 | ${ }_{6393}$ | 6378 | 6362 | ${ }_{6346} 6438$ | 633 | ${ }_{6315}$ | 6299 | 39 |  | 214 |  | $\left.\right\|_{37} ^{23}$ | 2479 |  | 4056 | 28171 | 2286 |  |  |
| 4 | 633 | 6319 | 6303 | 6287 | 627 | 6255 | 623 | 6223 | 620 |  |  |  |  |  |  |  |  |  |  |  | 41 |
| 42 |  | 6229 | 621 | 61 | 618 | 61 | 61 | 61 | 6114 |  |  |  |  |  |  |  |  |  |  |  | 2 |
|  | 615 | 61 | 6123 |  | 60 |  | 60 | 60 | 6022 | $42 \cdot 6$ |  |  |  |  |  |  |  |  | 835 |  | 43 |
|  |  |  |  |  |  |  | 5964 |  |  |  |  |  |  |  |  |  |  |  |  |  | 4 |
| 45 | 59 | 59 | 5 | 5925 | 5907 |  | 5872 |  |  |  | 6.0034 |  |  |  |  | 06 | 0813 |  | 1072 |  |  |
| 46 |  | 58 | 58 | 5834 |  | 578 |  |  | 57 | 45 |  |  |  |  |  |  |  |  |  |  |  |
| 47 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 33 |  |  |  |  | 7 |
| 4 | 57 | 561 | 56 | 563 |  | 56 | 5 | 538 |  |  |  |  |  |  |  | 472 |  |  |  |  | 8 |
| 50 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $51$ | 53 | 5331 | 53 | 52 |  | 52 | 5230 |  |  |  |  |  |  |  |  |  |  | 042 |  |  | 5 |
| 53 | 526 | 524 | 522 | 520 | 518 | 515 | 51 |  |  | $52 \cdot 50$ |  |  | 10 | 116 | 13 |  | 162 | 1777 |  |  |  |
| 54 | 51 | 51 | 513 | 51 |  | 5068 | 5 | 5025 |  | 53.4 | $7 \cdot 204$ | 219 | 23 | 25 |  | 281 |  |  |  |  | 5 |
| 55 | 508 | 50 | 504 | 5019 | 4998 | 49 | 4955 | 4933 | 4911 | 54.48 | 7.337 | 353 |  | 385 | 40 | 416 | 432 | 448 | 4644 |  | 5 |
|  | 499 | 4972 | 4951 | 4929 | 4907 | 4885 | 4863 | 4841 | 481 | 55 |  | 487 | 5032 |  | 5355 | 55 | 567 | 5839 | 6001 |  | 56 |
| 57 | 49 | 4893 | 486 | 483 | 4816 | 4794 | 477 | 47 | 4726 | 5 |  | 620 |  |  |  |  |  |  |  |  |  |
| $58$ |  | 479 |  | 47 | 47 | 4702 | 46 |  |  | 57.401 | 7.73 |  |  |  |  |  |  |  | 87 |  | 58 |
|  |  |  | 4680 |  |  | 46 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 463 | 4613 | 4590 | 4567 |  | 4520 | 4496 | 4472 |  |  |  |  |  | 0565 | 0738 |  | 1084 | 1256 |  |  |  |
| 61 |  |  | 兂 |  |  | 44 | 44 |  | 2 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 促 | 44 | 44 | 43 | 43 | 43 | 43 | 42 | 2 |  |  | 289 |  | 325 |  |  |  | 3965 | 4144 |  |  |
| 6 | 436 | 43 | 43 | 429 | 42 | 42 | 42 | 4196 | 4171 |  |  | 42 | 44 |  |  |  |  |  |  |  | 53 |
| 64 | 427 | 425 | 42 | 42 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 65 | 419 | 416 | 4 | 41 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 66 | 410 | 407 | 4049 | 4023 | 39 | 39 | 393 | 39 | 3894 |  |  | 824 | 843 |  |  |  | 919 | 9382 |  |  |  |
| $67$ | 40 | 39 | 39 | 393 |  | 388 |  |  |  |  |  | 957 |  |  |  |  |  |  |  |  |  |
| 68 | $392$ | 38 |  |  |  |  |  |  |  |  | 9. 971 |  |  |  |  |  |  |  |  |  | 69 |
| 70 | 374 |  | 3688 |  |  | 3606 | 3579 | 3551 | 3523 | 68.358 6934 | 205 |  | ${ }^{245}$ |  |  | 3047 4396 |  | 34799 |  |  |  |
| 71 |  | 362 | 359 |  | 35 | 3515 | 34 | 343 | 343 | $70^{\circ}$ | 9.472 | 4 | 5 |  |  |  |  | ${ }^{6153}$ | 63 |  |  |
|  |  | 3536 | 350 |  | 345 | 34 | 33 | 33 | 338 | 713 | $9 \cdot 60$ | 626 | 64 |  | 681 |  | 730 |  | 77 |  |  |
|  |  |  | 34 |  |  | 33 | 3303 | 3275 | 3246 | 72 | 9.73 |  |  |  |  | 8441 | 865 | 986 | 907 |  |  |
| 74 | 433 |  | 33 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 75 | 329 | 32 | 32 | 3208 | 3179 |  |  |  |  |  | 10.00 | 027 |  |  |  | 1138 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 7 | $10 \cdot 13$ | 161 |  |  |  |  |  |  |  |  | 76 |
| $77$ | 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 78 |
| 80 |  | 2818 | 278 |  | 2724 | 2693 |  | 2630 | 2598 | 79.25 | 10.67 | 69 | 718 | 742 | 765 |  | 17 | 83 | 8572 |  | 80 |
|  | 12759 | 27 |  | 26 | 2 | 26 |  |  | 2506 |  | 10 | 22 |  |  |  |  |  |  |  |  | ${ }^{81}$ |
|  | 2267 | 26 | 26 | 2574 | 2542 | 2510 | 2478 | 244 | 24 | 81.23 | 10 | 963 |  |  |  |  |  |  |  |  | ${ }_{83}^{32}$ |
| ${ }_{8}^{83}$ | ${ }^{3} 4$ | 245 | 24 | 2393 |  |  |  |  |  | 83 | 11.2064 |  | 25 |  |  |  |  |  |  |  | 84 |
| 85 | 2402 | 236 | 2336 | 23 | 2269 | 22 | 2203 | 216 | 2136 | 84 -210 | 11.339 | 364 | 398 | 413 | 437 | 462 | 486 | 511 | 5358 | 560 | 85 |
|  | 23 | 22 | 2246 | 22 | 2178 | 2145 | 21 | 2077 | 2043 | 85.2009 | 1 | 49 | 522 | 547 |  | 15972 | 622 |  |  |  | 86 |
|  | 72223 | 219 | 215 | 21 | 208 | 205 | 201 | 19 | 195 | 86.1 | 11.60 | 6317 | 656 | 68 |  | 7320 |  |  | 8073 |  |  |
|  |  |  |  | 203 | 1996 | 19 | ${ }_{183}^{1927}$ | 188 | ${ }_{176}^{185}$ | ${ }_{88}^{87} 1$ | 11.748 1187 |  | 924 | 8 | 84 97 |  |  | 9176 | 9430 0787 |  | 88 |
| 90 | ${ }^{9} 20454$ | 192 | 5 |  | 1815 | 1779 | 1744 | 1709 | 1673 | ${ }_{89} 8163$ | 12.006 | 032 | 05 | 084 | 111 | 136 | 1625 | 1885 | 2144 |  | 90 |
|  |  |  | 17 |  | 17 | 168 | 165 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 17 | 17 | 15 | 1633 | 1597 | 1560 | 1524 | 1488 | 91:14 | 12.2 | 3002 | 32 | 35 |  | 40 | 4328 | 4593 |  |  |  |
| 93 | 168 | 165 | 1614 | 15 | 15 | 1505 | 146 | 143 | 135 | $92 \cdot 1$ |  |  |  |  |  | 54 |  |  |  |  |  |
| 94 9 |  |  |  |  |  | 14 | 1278 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 14 |  |  |  |  |  |  |  |  |  | 12 |  |  |  |  |  |  |  |  |  |  |
|  | 132 | 1291 | 1254 | 1216 | 1178 |  |  |  |  |  |  | 968 |  |  |  |  |  |  |  |  |  |
|  | 1240 | 120 |  | 1125 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1150 |  |  |  |  |  |  | 0787 | 0840 | 98.0801 99.0708 |  | 369 | 3646 | ${ }_{4274}^{293}$ | 3217 | 3502 | 3788 5139 | 4073 <br> 5427 | 4358 5716 |  |  |
|  | $20^{\prime}$ | 19 | 18 | 17 | $16^{\prime}$ | 15 | 14 | 13 |  | 11 |  |  |  |  | 16 | 5 | 14 |  |  | 1 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $7{ }^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $7^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | $51^{\prime}$ | 52 | $53^{\prime}$ | $54^{\prime}$ | 55 | $56^{\prime}$ | 57 | 58 | 59 | 50 | $51^{\prime}$ | 52 | 53 | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | 58 | 59 |  |
| 1 | 9907 | 9906 | 990 | 9905 | 9905 | 9905 | 9904 | 9904 | 9903 | ＇9903 | 1363 | 1366 | 1369 | 1372 | 1374 | 1377 | 1380 | 1383 | 13 | 1389 |  |
| 2 | 9813 | 9813 | 9812 | 9811 | 9810 | 9809 | 980 | 9808 | 9807 | 1.9806 | 2726 | 2732 | 2737 | 2743 | 274 | 2755 | 2760 | 276 | 2772 | 2778 |  |
| 3 | 9720 | 9719 | 9718 | 9716 | 9715 | 9714 | 9713 | 9712 | 9710 | 2.9709 | 4089 | 4097 | 4106 | 4115 | 4123 | 4132 | 4141 | 4149 | 4158 | 4167 |  |
| 4 | 9627 | 9625 | 9624 | 9622 | 9620 | 9619 | 9617 | 9616 | 9614 | 3.9612 | 5452 | 5463 | 5475 | 5486 | 5498 | 5509 | 5521 | 5532 | 5544 | 5555 |  |
| 5 | 9533 | 9531 | 9529 | 952 | 9525 | 9523 | 952 | 9519 | 517 | $4 \cdot 951$ | －6815 | 6829 | 6843 | 858 | 6872 | 6887 | 6901 | 6915 | 693 | 694 |  |
| 6 | 9440 | 9438 | 9435 | 9433 | 9431 | 9428 | 9426 | 9423 | 9421 | 5.9419 | －8178 | 8195 | 8212 | 8229 | 8247 | 64 | 21 | 9 | 16 | 8333 | 6 |
| 7 | 9347 | 934 | 934 | 933 | 9336 | 9333 | 933 | 932 | 9324 | 632 | 9540 | 9561 | 95 | 96 | 96 | 9641 | 9661 | 9682 | 9702 | 9722 |  |
| 8 | 9253 | 9250 | 9247 | 9244 | 9241 | 9238 | 9234 | 9231 | 9228 | 7.9225 | 1.0903 | 0926 | 0949 | 0973 | 0996 | 1019 | 1042 | 1065 | 1088 | 1111 |  |
|  | 9160 | 9157 | 9153 | 914 | 9146 | 9142 | 9139 | 9135 | 9131 | 8.912 | 1.2266 | 2292 | 2318 | 2344 | 2370 | 2396 | 2422 | 2448 | 2474 | 250 |  |
| 10 | 9067 | 9063 | 9059 | 9055 | 9051 | 9047 | 9043 | 9039 | 9035 | 9．9031 | 1.3629 | 3658 | 3687 | 3716 | 3744 | 3773 | 3802 | 3831 | 3860 | 388 | 10 |
| 11 | 8974 | 8969 | 8965 | 8960 | 8956 | 8952 | 894 | 8943 | 8938 | 10. | 14992 | 5024 | 50 | 5087 | 5119 | 5151 | 518 | 521 | 5246 | 5277 | 11 |
| 12 | 8880 | 8875 | 8871 | 8866 | 8861 | 8856 | 8852 | 8847 | 8842 | 1：8837 | 1.6355 | 6390 | 6424 | 6459 | 6493 | 6528 | 6562 | 6597 | 6632 | 666 | 12 |
| 13 | 8787 | 8782 | 8777 | 8771 | 8766 | 8761 | 8756 | 8751 | 8745 | 12.8740 | 17718 | 7755 | 7793 | 7830 | 7868 | 7905 | 7943 | 7980 | 8018 | 805 | 13 |
| 14 | 8694 | 8688 | 8683 | 8677 | 8671 | 8666 | 8660 | 8654 | 8649 | 13.8643 | 1.9081 | 9121 | 9162 | 9202 | 9242 | 9283 | 9323 | 9363 | 9404 | 9444 | 14 |
| 15 | 86 | 8594 | 8588 | 858 | 8576 | 570 | 564 | 855 | 8552 | 14.8546 | 2.0444 | 0487 | 053 | 0573 | 0617 | 660 | 070 | 074 | 0790 | 0833 | 15 |
| 16 | 8507 | 8501 | 84 | 84 | 8482 | 8475 | 8469 | 84 | 84 | $15 \cdot 8449$ | $2 \cdot 1807$ | 53 | 189 | 1945 | 1991 | 2037 | 2083 | 21 | 21 | 2222 | 16 |
| 17 | 8414 | 8407 | 8400 | 8393 | 8387 | 8380 | 8373 | 83 | 83 | 16.835 | 2.31 | 3219 | 3268 | 3317 | 33 | 3415 | 3464 | 3513 | 3561 | 36 | 17 |
| 18 | 8320 | 8313 | 8306 | 8299 | 8292 | 8284 | 8277 | 8270 | 8263 | $17 \cdot 8256$ | 2.4533 | 4584 | 4636 | 4688 | 47 | 4792 | 4844 | 4896 | 4947 | 4999 | 18 |
| 19 | 8227 | 8220 | 8212 | 820 | 8197 | 8189 | 8182 | 8174 | 8166 | 18.815 | 2.5895 | 5950 | 6005 | 6060 | 6114 | 6169 | 6224 | 627 | 6333 | 638 | 19 |
| 20 | 8134 | 8126 | 8118 | 8110 | 8102 | 8094 | 8086 | 8078 | 8070 | 19.8062 | 2.7258 | 7316 | 7374 | 7431 | 748 | 7547 | 760 | 766 | 7719 | 777 | 20 |
| 21 | 8040 | 退3 | 8024 | 80 | 007 | 7999 | 7990 | 798 | 7973 | 20．79 | 2 | 682 | 8742 | 88 | 88 | 8924 | 8984 | 9045 | 9105 | 9166 | 21 |
| 22 | 7947 | 7938 | 793 | 792 | 7912 | 7903 | 7894 | 7886 | 7877 | $21 \cdot 7868$ | $2 \cdot 9984$ | －048 | 0111 | 0174 | 0238 | 0301 | 0365 | 042 | 0491 | 055 | 22 |
| 23 | 7854 | 7845 | 7836 | 7826 | 7817 | 7808 | 7799 | 7789 | 7780 | 22.7771 | $3 \cdot 1347$ | 1413 | 1480 | 1546 | 1612 | 1679 | 1745 | 181 | 1877 | 194 | 23 |
| 24 | 7760 | 7751 | 7741 | 7732 | 7722 | 7713 | 7703 | 7693 | 7684 | 23＇7674 | 3.2710 | 2779 | 2848 | 2918 | 2987 | 3056 | 3125 | 3194 | 3263 | 3332 | 24 |
| 25 | 7667 | 7657 | 7647 |  | 17627 | 7617 | 07 | 7597 | 7587 | 24．7577 | 3.4073 | 4145 | 4217 | 4289 | 4361 | 4433 | 4505 | 4577 | 4649 | 472 | 25 |
| 26 | 7574 | 7564 | 755 | 754 | 75 | 7522 | 75 | 750 | 491 | 25.748 | 3.5436 | 5511 | 558 | 56 | 5736 | 581 | 5885 | 5960 | 6035 | 6110 | 26 |
| 27 | 7481 | 7470 | 745 | 74 | 7438 | 7427 | 7416 | 7405 | 7394 | 26 | 3.6799 | 6877 | 695 | 70 | 71 | 7188 | 726 | 7343 | 7421 | 7499 | 27 |
| 28 | 7387 | 7376 | 7365 | 7354 | 7343 | 7331 | 7320 | 7309 | 7298 | 27＇72 | 3.8162 | 8242 | 8323 | 840 | 8484 | 8565 | 8646 | 8726 | 8807 | 888 | 28 |
| 29 | 7294 | 7282 | 7271 | 7259 | 7248 | 7236 | 7224 | 7213 | 201 | 28. | 3.9 | 9608 | 969 | 977 | 9859 | 9942 | － 026 | 0110 | 0193 | 027 | 29 |
| 30 | 7201 | 7189 | 7177 | 65 | 53 | 7141 | 7129 | 7117 | 105 | 29•7093 | 4.0888 | 0974 | 106 | 1147 | 1233 | 132 | 140 | 1493 | 1579 | 166 | 30 |
| 31 | 7107 | 7095 | 7083 | 7070 | 7058 | 7046 | 7033 | 7021 | 7008 | 30.699 | 4.2250 | 2340 | 2429 | 2518 | 2608 | 2697 | 2786 | 2876 | 2965 | 3054 | 31 |
| 32 | 7014 | 7001 | 6989 | 6976 | 6963 | 6950 | 6937 | 6925 | 6912 | 31.68 | 4.3613 | 3706 | 3798 | 3890 | 3982 | 4074 | 416 | 4259 | 4351 |  | 32 |
| 33 | 6921 | 6908 | 6894 | 6881 | 6868 | 6855 | 6842 | 6828 | 6815 | 32 | 4.4976 | 5071 | 5167 | 5262 | 5357 | 5452 | 554 | 5642 | 5737 | 5832 | 33 |
| 34 | 6827 | 6814 | 6800 | 6787 | 6773 | 6760 | 6746 | 6732 | 6719 | $33 \cdot 670$ | 4.6339 | 6437 | 6535 | 6633 | 6731 | 6829 | 6927 | 702 | 7123 | 22 | 34 |
| 35 | 6734 | 6720 | 析 | 6692 | 6678 | 6664 | 6650 | 6636 | 6622 | 660 | $4 \cdot 7702$ |  | 7904 | 8005 | 8106 | 8206 | 830 | 340 | 509 | 861 | 35 |
| 36 | 6641 | 6626 | 6612 | 659 | 6583 | 6569 | 655 | 654 | 65 | 35 | －9065 | 9169 | 9273 | 9376 | 9480 | 9584 | 96 | 97 | 9895 | 999 | 36 |
| 37 | 6547 | 6533 | 6518 | 65 | 6489 | 6474 | 6459 | 6444 | 229 | 36.641 | 5.0428 | 0535 | 064 | 0748 | 0854 | 096 | 106 | 11 | 1281 | 138 | 37 |
| 38 | 6454 | 6439 | 6424 | 6409 | 6394 | 6378 | 636 | 6348 | 6333 | 37．63 | 5．1791 | 1900 | 2010 | 2119 | 2229 | 233 | 24 | 25 | 67 | 277 | 38 |
| 39 | 6361 | 6345 | 6330 | 6314 | 6299 | 6283 | 626 | 62 | 6236 | 38.62 | 5.3154 | 3266 | 3379 | 34 | 3603 | 3716 | 3828 | 3940 | 4053 | 416 | 39 |
| 40 | 6267 | 6252 | 6236 | 6220 | 6204 | 6188 | 6172 | 6156 | 6140 | 39．6123 | 5.4517 | 4632 | 4747 | 4863 | 4978 | 509 | 5208 | 5324 | 5439 | 555 | 40 |
| 41 | 61 | 6158 | 61 | 6125 | 6109 | 6092 | 6076 | 6060 | 6043 | 40 | 5.5880 | 5998 | 6116 | 6234 | 6352 | 6470 | 6589 | 6707 | 6825 |  | 41 |
| 42 | 6081 | 6064 | 6048 | 6031 | 6014 | 5997 | 5980 | 5963 | 5947 | 41.593 | 7243 | 7364 | 7485 | 7 | 7727 | 7848 | 79 | 8090 | 821 | 833 | 42 |
| 43 | 5988 | 5970 | 5953 | 5936 | 5919 | 5902 | 5885 | 5867 | 5850 | 42.58 | 5.8606 | 8729 | 8853 | 897 | 9101 | 9225 | 93 | 947 | 9597 | 97 | 43 |
| 44 | 5894 | 5877 | 5859 | 5842 | 5824 | 807 | 5789 | 5771 | 5754 | 43.573 | 5. | －095 | 0222 | 0349 | 0476 | 0602 | 072 | 0856 | 0983 | 110 | 44 |
| 45 | 5801 | 5783 | 5765 | 5747 | 5729 | 5711 | 5693 | 5675 | 5657 | 44．5639 | 6.13 | 146 | 1591 | 1720 | 1850 | 1980 | 2109 | 2239 | 2369 | 249 | 45 |
| 46 | 5708 | 568 | 567 | 56 | 5634 | 5616 | 559 | 557 | 556 | 45 | 6.2694 | 2827 | 2959 | 3092 | 3224 | 3357 | 3490 | 36 | 3755 | 8887 | 46 |
| 47 | 5614 | 5596 | 557 | 55 | 5539 | 5521 | 5502 | 5483 | 5464 | $46 \cdot 5$ | $6 \cdot 4057$ | 4193 | 4328 | 4464 | 45 | 473 | 4870 | 50 | 5141 | 527 | 47 |
| 48 | 5521 | 5502 | 5483 | 5464 | 5445 | 5425 | 5406 | 5387 | 5367 | 47．534 | $6 \cdot 542$ | 5558 | 5697 | 5835 | 5973 | 6112 | 6250 | 6388 | 6527 | 666 | 48 |
| 49 | 5428 | 5408 | 5389 | 5369 | 5350 | 5330 | 5310 | 529 | 5271 | 48.52 | 6.6783 | 6924 | 7065 | 7207 | 7348 | 7489 | 7630 | 7771 | 7913 | 805 | 49 |
| 50 | 5334 | 5315 | 5 | 5275 | 52 | 35 | 15 | 95 | 5174 | 49.5 | 6.8146 | 8290 | 8434 | 8578 | 8722 | 8866 | 9010 | 9154 | 9299 | 944 | 50 |
|  | 52 | 52 | 5 | 5180 | 5160 | 5139 | ， | 5098 | 5078 | 50．505 | 6.9509 | 9656 | 9803 | 9950 | ＋097 | 0244 | 0391 | 0538 | 0684 |  | 1 |
| 52 | 5148 | 5127 | 5106 | 5086 | 5065 | 5044 | 5023 | 5002 | 4981 | 51.496 | 087 | 1022 | 1172 | 1321 | 1471 | 162 | 177 | 192 | 2070 | 222 | 52 |
| 53 | 5054 | 5033 | 5012 | 4991 | 4970 | 4949 | 4928 | 4906 | 4885 | 52.486 | －2235 | 2387 | 2540 | 2693 | 2846 | 29 | 315 | 3304 | 3456 | 220 | 53 |
| 54 | 4961 | 4940 | 4918 | 4897 | 4875 | 4853 | 4832 | 4810 | 4788 | 53.476 | 7.359 | 3753 | 3909 | 4064 | 4220 | 437 | 4531 | 4687 | 4842 | 499 | 54 |
| 55 | 4868 | 484 | 4824 | 4802 | 4780 | 475 | 4736 | 4714 | 4692 | 54.4670 | 49 | 5119 | 5278 | 336 | 594 | 5753 | 59 | 6070 | 6228 | 638 | 55 |
| 56 | 4774 | 4752 | 4730 | 4708 | 4685 | 4663 | 4640 | 4618 | 4595 | 55．4573 | $7 \cdot 6323$ | 6485 | 6646 | 6808 | 6969 | 7130 | 7292 | 7453 | 7614 |  | 56 |
| 57 | 4681 | 4659 | 4636 | 4613 | 4590 | 4568 | 4545 | 4522 | 4499 | 56.447 | 77686 | 7851 | 8015 | 8179 | 8343 | 8508 | 8672 | 8836 |  |  | 57 |
| 58 | 4588 | 4565 | 4542 | 4519 | 4496 | 4472 | 4449 | 4426 | 4402 | 57.437 | 7.9049 | 9216 | 9384 | 9551 | 9718 | 9885 | ＋0 | 0219 | 038 |  | 58 |
| 59 | 44 | 4471 | 4448 | 4424 | 4401 | 4377 | 4353 | 4330 | 4306 | 58.4282 | 8.0412 | 0582 | 0752 | 0922 | 1092 | 1262 | 143 | 1602 | 177 | 194 | 59 |
| 60 | 4401 | 4377 | 4354 | 4330 | 306 | 4282 | 4258 | 4233 | 4209 | 59.4185 | 8.1775 | 1948 | 2121 | 2294 | 2467 | 2640 | 2812 | 2985 | 315 | 333 | 60 |
|  | 4308 | 428 | 4259 | 4235 | 11 | 4186 | 41 | 4137 | 113 | 60．408 | 8.3138 |  | 34 |  |  | 401 | 4193 | 4368 |  |  | 61 |
| 62 | 4215 | 4190 | 4165 | 4141 | 4116 | 409 | 4066 | 4041 | 4016 | 61399 | 8.4501 | 4680 | 4858 | 5037 | 5216 | 5394 | 5573 | 5752 | 5930 |  | 62 |
| 63 | 4121 | 4096 | 4071 | 4046 | 4021 | 3996 | 3970 | 3945 | 3920 | $62 \cdot 389$ | 8.5864 | 6045 | 6227 | 6409 | 6590 | 6772 | 6953 | 7135 | 7316 | 74 | 63 |
| 6 | 4028 | 4003 | 3977 | 52 | 26 | 3900 | 3875 | 3849 | 3823 | 63.379 | $8 \cdot 7227$ | 7411 | 7596 | 寿 |  | 142 | 8333 | 8518 |  |  | 64 |
| 65 | 3935 | 390 | 388 | 3857 | 3831 | 3805 | 377 | 375 | 3727 | 64．370 | 859 | 8777 | 8964 | 9152 | 933 | 952 | 971 | 9901 | 108 | 027 | 65 |
| 66 | 3841 | 3815 | 37 | 3763 | 3736 | 3710 | 3683 | 3657 | 3630 | 65.360 | 8.9953 | ＋143 | 0333 | 0523 | 0713 | 0904 | 1094 | 1284 | 1474 | 16 | 66 |
|  | 374 | 3721 |  |  | 3641 | 3614 | 358 | 3561 | 3534 | 66.350 | 9.1316 | 1509 | 1702 | 1895 | 2088 | 2281 | 2474 | 2667 | 286 | 30 | 67 |
| 68 | 3655 | 3628 | 3601 | 3574 | 3546 | 3519 | 3492 | 3465 | 3437 | 67.341 | 9．2678 | 2874 | 3070 | 3266 | 3462 | 3658 | 3854 | 4050 | 4246 | 44 | 68 |
| 69 | 3561 | 3534 | 3507 | 3479 | 3452 | 3424 | 3396 | 3368 | 3341 | 68.3313 | 9＊4041 | 4240 | 4439 | 4638 | 4837 | 5036 | 5234 | 5433 | 5632 | 583 | 69 |
| 70 | 3468 | 3440 | 3413 | 385 | 3357 | 3329 | 3301 | 3272 | 3244 | 69.3216 | ． 5404 | 5606 | 5808 | 6009 | 6211 | 6413 | 661 | 6816 | 701 | 72 | 70 |
| 71 | 3375 | 3347 | 3318 | 90 | 3262 | 3233 | 3205 | 3176 | 3148 | $70 \cdot 311$ | $9 \cdot 6767$ | 6972 | 硡 | 73 |  | 7190 |  |  |  |  | 71 |
| 72 | 3281 | 3253 | 3224 | 3196 | 3167 | 3138 | 3109 | 3080 | 3051 | 71302 | 9.8130 | 8338 | 8545 | 8753 | 8960 | 9168 | 9375 | 9582 | 9790 | 999 | 72 |
| 73 | 3188 | 3159 | ， | O | 3072 | 3043 | 3013 | 2984 | 2955 | 72，2925 | 9.9493 | 9703 | 9914 | －124 | 0334 | 0545 | 0755 | 0965 | 1176 | 138 | 73 |
| 74 | 3095 | 3065 | 3036 | 3007 | 2977 | 2947 | 2918 | 2888 | 2858 | 73.2828 | 10.0856 | 1069 | 1283 | 1496 | 1709 | 1922 | 2135 | 2349 | 2562 | 27 | 74 |
| 75 | 300 | 2972 | 2942 | 12 | 2882 | 285 | 2822 | 2792 | 276 | 74．2731 | 10.2219 | 243 | 265 | 286 | 308 | 330 | 351 | 3732 | 394 | 416 | 75 |
| 76 | 2908 | 2878 | 2848 | 2818 | 2787 | 2757 | 2726 | 2696 | 2665 | 75．2634 | 10.3582 | 3801 | 4020 | 4239 | 4458 | 4677 | 4896 | 5115 | 5334 | 5553 | 76 |
| 77 | 2815 | 2784 | 275 |  | 269 | 266 | 2631 | 2600 | 2569 | 76.2538 | 10.4945 | 5167 | 5389 | 5610 | 5832 | 6054 | 6276 | 6498 | 6720 | 69 | 77 |
| 78 | 2722 | 2691 | 2660 | 2629 | 2597 | 2566 | 2535 | 2503 | 2472 | $77 \cdot 2441$ | 10.6308 | 6532 | 6757 | 6982 | 7207 | 7432 | 7656 | 7881 | 8106 | 833 | 78 |
|  | 2628 | 2597 | 2566 | 23 | 2503 | 2471 | 2439 | 2407 | 2376 | 78.2344 | 10.7671 | 7898 | 8126 | 8354 | 8581 | 8809 | 9036 | 9264 | 9492 | 971 | 79 |
| 80 | 2535 | 2503 | 2471 | 2440 | 2408 | 2376 | 2343 | 2311 | 2279 | 79.2247 | 10.9034 | 9264 | 9495 | 9725 | 995 | －186 | 041 | 0647 | 087 | 1108 | 0 |
| 81 | 2442 | 2409 | 2377 | 2345 | 2313 | 2280 | 2248 | 2215 | 2183 | 80.2150 | 11.0396 | 0630 | 883 | 109 | 133 | 1563 | 1797 | 2030 |  |  | 81 |
| 82 | 2348 | 2316 | 2283 | 2251 | 2218 | 2185 | 2152 | 2119 | 2086 | 81＇2053 | 11.1759 | 1996 | 2232 | 2468 | 2704 | 2941 | 3177 | 3413 | 3650 | 3886 | 82 |
| 8 | 225 | 22120 | 2189 | 2561 | 2123 | 299 | 2056 | 2023 | 1990 | 82．1956 | 11.3122 | 3361 | 3601 | 3840 | 4079 | 4318 | 4557 | 4796 | 5036 | 527 | 83 |
| 84 | 2162 | 2128 | 2095 | 2061 | 2028 | 1994 | 1961 | 1927 | 1893 | $83 \cdot 1859$ | $11 \cdot 4485$ | 4727 | 4969 | 5211 | 5453 | 5695 | 5937 | 6179 | 6421 | 666 | 84 |
| 85 | 2068 | 2035 | 201 | 967 | 933 | 1899 | 1865 | 1831 | 1797 | 84．1762 | 11.5848 | 6093 | 6338 | 658 | 682 | 707 | 7318 | 7563 | 780 | 8052 | 85 |
| 86 | 1975 | 184 | 1907 | 1872 | 1838 | 1804 | 1769 | 1735 | 1700 | 85．1665 | 117211 | 7459 | 7707 | 7955 | 8202 | 8450 | 8698 | 8946 | 9193 | 944 | 86 |
| 87 | 1882 | 1847 | 1813 | 1778 | 1743 | 1708 | 157 | 1639 | 1604 | 86.1568 | 11.8574 | 8825 | 9075 | 9326 | 9577 | 9827 | －078 | 0329 | 0579 | 083 | 87 |
| 88 | 1788 | 1754 | 1719 | 1683 | 1648 | 1613 | 1578 | 1542 | 1507 | $87 \cdot 1471$ | 11.9937 | ＋190 | 0444 | 0698 | 0951 | 1205 | 1458 | 1712 | 1965 | 221 | 88 |
| 89 | 1695 | 1660 | 122 | 1589 | 1553 | 1518 | 1482 | 1446 | 1411 | 88.1375 | $12 \cdot 1300$ | 1556 | 1813 | 2069 | 2326 | 2582 | 2839 | 3095 | 3351 | 360 | 89 |
| 90 | 1602 | 1566 | 1530 | 1494 | 1459 | 1422 | 1386 | 1350 | 1314 | $89 \cdot 1278$ | 12.2663 | 2922 | 3181 | 344 | 3700 | 285 | 421 | 4478 | 4737 | 499 | 90 |
| 91 | 1509 | 1472 | 1436 | 1400 | 1364 | 1327 | 1291 | 1254 | 1217 | $90 \cdot 118$ | 12.4026 | 4288 | 4550 | 4812 | 5074 | 5337 | 5599 | 5861 | 6123 | 638 | 9 |
| 92 | 1415 | 1379 | 1342 | 1305 | 1269 | 1232 | 1195 | 1158 | 1121 | $91 \cdot 1084$ | 12.5389 | 5654 | 5919 | 6184 | 6449 | 6714 | 6979 | 7244 | 7509 | 7774 | 92 |
| 93 | 1322 | 1285 | 1248 | 1211 | 1174 | 1137 | 1099 | 1062 | 1024 | 92.0987 | $12 \cdot 6751$ | 7019 | 7288 | 7555 | 7823 | 8091 | 8359 | 8627 | 8895 | 9163 | 93 |
| 94 | 1229 | 1191 | 1154 | 1116 | 1079 | 1041 | 1004 | 0966 | 0928 | 93.0890 | 12.8114 | 8385 | 8656 | 8927 | 9198 | 9469 | 9740 | －010 | 0281 | 0552 | 94 |
| 95 | 1135 | 1098 | 1060 | 1022 | 0984 | 0946 | 0908 | 0870 | 83 | 94．0793 | 12．9477 | 9751 | －025 | 0299 | 0572 | 084 | 112 | 139 | 1667 | 1941 | 95 |
| 96 | 1042 | 1004 | 0966 | 0927 | 0889 | 0851 | 0812 | 0774 | 0735 | 95.0696 | 13.0840 | 1117 | 1394 | 1670 | 1947 | 2223 | 2500 | 2777 | 3053 | 3331 | 96 |
| 97 | 0949 | 0910 | 0872 | 0833 | 0794 | 0755 | 0716 | 0677 | 0638 | 96.0599 | 13.2203 | 2483 | 2762 | 3042 | 3321 | 3601 | 3880 | 4160 | 4439 | 4718 | 97 |
| 98 | 0855 | 0816 | 077 | 0738 | 069 | 0660 | 0621 | 0581 | 0542 | 97.0502 | 13.3566 | 3848 | 4131 | 4413 | 4696 | 4978 | 526 | 5543 | 5825 | 6107 | 98 |
|  | 0762 | 0723 | 0683 | 0644 | 0604 | 0565 | 0525 | 0485 | 0445 | 98.0405 | $13^{\circ} 4929$ | 5214 | 5500 | 5785 | 6070 | 6355 | 6641 | 6926 | 7211 | 7496 | 99 |
| 100 | 0669 | $\frac{0629}{}$ | 589 | $\frac{549}{}$ | 0510 | 469 | 0429 | 0389 | 0349 | 99.0309 | 13.6292 | 6580 | 6868 | 7156 | 7445 | 7733 | 8021 | 8309 | 8597 | 8885 | 100 |
|  | 10 | $1 y^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | ｜ $4^{\prime}$ | $3^{\prime}$ | ＇ | 1 | $10^{\prime}$ | ＇ | \％ | ， | $6^{\prime}$ | $5^{\prime}$ | － | ， | \％ | 1 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Cos | N |  |  |  |  | $82^{\circ}$ |

TRAVERSE TABLES.

| $8^{\circ}$ | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $8^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 2 | 3 | T | T |  |  |  |  |  |  |  | $3^{\prime}$ | $4^{\prime}$ |  |  |  |  |  |  |
|  |  | 99 | 9902 | 9901 | 9901 | 9901 |  |  |  |  |  |  |  | 400 | 1403 |  |  | 12 | 1415 | 1418 |  |
|  |  | 9805 | 9804 | 9803 | 9802 9703 |  |  |  |  |  | -2783 | 2789 | 2795 | 2801 | 2807 | 2812 | 2818 | 24 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | ${ }_{5}^{4} 99513$ |  | 9509 |  |  |  |  |  | 94 | 4.949 | 695 |  |  | 7002 | 7016 | 7031 |  |  |  |  | 4 |
|  | 9416 | 9414 | 941 | 94 | 94 | 94 | 94 | 193 | 193 | 5.9 | -8350 | 8368 | 8385 | 8402 | ${ }^{8420}$ | \|8437 | 4 | 1 |  |  |  |
|  | 3319 | 9316 | 9313 | 93 |  |  |  | 92 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9221 | 92 | 9215 |  |  |  |  |  | 91 | 7.91 | 1.1134 | 11 | 1180 | 120 |  | 1249 | 1272 | 129 | 131 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 2577 |  |  |  |  |  |  |  |  |
| -1 | 19027 | 9023 |  |  | 9011 | 9006 | 9002 |  |  |  | 1.39 |  | 3975 | 4004 |  | 4061 |  | 4119 |  |  |  |
| 11 | 18929 | 8925 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 8692 |  |  | 81 | 8167 | 820 | 824 | 8280 | 831 | 835 | 839 |  | 3 |
|  | 863 | 8632 | 8626 | 862 | 8615 | 8609 | 8603 | 85 | 8592 |  | 1.948 | 9525 | 9565 | 9605 |  | 9686 |  |  |  |  | 4 |
| 15 | 854 |  |  |  |  |  |  |  |  | 14.84 | 2 | 0919 |  | 100 | 1049 | 292 | 1135 | 117 | 122 |  | 15 |
| 16 | 68443 |  |  |  | 84 | 84 | 8404 | 8397 | 8391 | 15.838 | 2. | 2314 | ${ }^{23}$ | 2406 | 2452 | 2498 | 2544 | 2590 | 26 |  | 16 |
| 17 |  | 8339 |  |  | 83 | 83 | 8304 |  | 8290 |  |  |  | 3757 |  | 3855 |  |  |  |  |  | 7 |
| 18 | 3248 | 8241 | 82 | 82 | 82 | ${ }^{1}$ |  | 8197 | 8189 | 17 | , | 5103 | 5155 | 5207 | 5259 | 5310 | 5362 | 5414 |  |  | 18 |
| 19 | 8151 |  | 81 | 81 |  |  |  |  |  | 18 | 2.64 |  |  |  |  | 571 |  |  |  |  | 19 |
| 20 | 20854 | 8046 | 803 |  | 820 | 801 | 800 | 799 | 7988 | 19. | 2.78 | 789 | 795 | 800 |  | 3123 | 8180 | 8238 | 829 |  | 20 |
| 21 | 7956 | 7945 | 793 | 793 | 792 | 791 |  |  | 788 | $20 \cdot 78$ | . 92 |  |  |  |  |  |  |  |  |  | 1 |
| 22 |  | 78.5 | 78 | 783 | 78 |  |  |  | 7787 | 217 |  | 06 |  |  |  | 0935 | 098 | 106 |  |  | 2 |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  | 220 | 227 | 2341 | 24 | 247 |  |  | 2 |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 367 | 374 | 3816 |  |  |  | 24 |
| 25 | 75 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 |
| 26 |  |  |  | 7438 |  |  |  |  |  | 25.73 |  |  |  |  | 648 | 6559 | 6634 | 6709 | 6784 |  | 26 |
| $\begin{gathered} 27 \\ 28 \end{gathered}$ | 7372 | 73 | 7350 | 73 |  | 73 |  |  |  |  |  |  |  |  |  |  |  | 21 |  |  | 27 |
|  |  |  |  |  |  |  |  |  |  | 27 |  |  |  |  |  | 72. |  | 9533 |  |  | ${ }^{28}$ |
|  |  |  |  |  | 71 |  |  |  | 70 | 28.70 | 4.036 | 04 |  |  |  | 0778 |  |  |  |  | 9 |
| 30 | 7080 | 7068 | 70 |  | 7032 | 70 | 70 | 6995 | 6982 | 29.697 | $4 \cdot 17$ | 1838 | 1925 | 201 | 209 | 2184 | 2270 | 235 | 24 |  | 30 |
| 31 | 6983 | 69 | 695 | 69 | 69 | 69 | 59 | 69 | 688 | ${ }^{30.686}$ |  | 32 |  |  |  |  |  |  |  |  | 31 |
| 32 |  | 68 | 68 | 6 | 68 | 68 | 6808 |  | 67 | 31.6 |  |  |  |  |  |  |  |  |  |  |  |
| 33 | 67 | 673 |  |  |  |  |  |  | 66 |  |  |  |  |  |  |  |  | 65 |  |  | 3 |
|  |  |  |  |  |  |  |  |  |  |  | 4.73 | 74 |  |  |  |  |  |  |  |  | 34 |
| 35 | 56594 | 658 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 35 |
|  |  |  |  |  |  |  |  |  |  | $35 \cdot 636$ |  |  |  | 0413 | 051 |  |  |  |  |  | 36 |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 37 |
|  | 630 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 88 |
| 40 | ${ }_{6}{ }_{6}^{6205}$ |  |  |  |  | 602 | 60 | 5993 | 5977 | 39.596 | $5 \cdot 5669$ | $5784$ | 5900 | $6015$ | 6130 | 624 |  |  |  |  | 39 |
| 41 |  |  |  |  |  | 592 |  | 58 |  | $140 \cdot 58$ |  | 71 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 41.57 |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 3815 | 579 |  |  |  |  |  |  | 56 | 42.56 | 5.98 | 99 | 0 |  |  | 0464 | 05 | 07 |  |  |  |
|  | 5718 |  | 5682 |  |  |  |  |  | 55 | $43 \cdot 55$ |  |  |  |  |  |  |  |  |  |  | 44 |
| 45 | 55621 | 56 | 55 | 55 | 5547 |  | 55 | 5492 | 5474 | 44.55 | $6 \cdot 26$ | 27 | 2887 | 3017 |  | 327 |  |  |  |  | 45 |
| 46 | 65523 | 55 |  | 54 | 54 |  |  |  |  | 45.53 |  |  |  |  |  |  |  |  |  |  | 46 |
|  | 5426 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 62 |  |  |  |  |
| 48 | 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 48 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | 1334 | 5114 | 5093 |  |  |  | 5012 | 4991 | 4971 | 49.495 | 6.9587 | 973 | 9875 | -019 | 0163 | 0307 |  | 0595 |  |  |  |
| 51 |  | 5016 |  |  | 4954 | 4933 |  | 4891 | 4870 |  |  | 1125 | 12 |  | 156 |  |  |  |  |  |  |
|  |  | 49 | 48 |  | 4855 |  | 4812 |  |  |  | 7.23 | 2520 |  | 281 |  |  |  | 34 |  |  |  |
| 53 | 34842 | 482 | 479 | 477 |  | 47 | , | 469 | 4669 | 52.46 | $7 \cdot 3762$ | 39 | 406 | 422 | 437 | 45 |  |  |  |  | 53 |
| 54 |  | 47 | 470 | 46 | 46 | 46 | 4613 |  | 45 | 53.45 | 7.515 |  | 546 | 562 |  |  |  |  |  |  | 54 |
| 55 | 464 | 4625 | 4603 | 45 | 4558 | 453 | 451 | 44 | 4 | 54.44 | 7.65 |  |  | 702 | 717 | 73 | 74 |  |  |  | 55 |
| 56 | 455 | 45 | 45 | 44 | 44 | 44 | 44 | 430 | ${ }^{4367}$ | 15.43 | 7.79 | 809 | ${ }^{82}$ |  | 8582 | 874 | 89 |  |  |  | 56 |
| 57 | 44 | 44 | 44 | 43 |  | 43 | 43 |  | 42 |  | $7 \cdot 93$ | 94 |  |  |  | , | O |  |  |  | 57 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 17 |  |  |  | 58 |
| 59 | 925 | 423 | 421 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | d |
|  |  |  |  | 38 | 388 | 38 | 3815 |  | 37 |  |  |  |  |  |  |  |  |  |  |  | 62 |
| 63 |  | 38 | 3818 |  |  |  |  |  |  |  | 8.76 |  |  | 822 | 8405 |  |  |  |  |  | 63 |
| 64 |  |  |  |  |  |  |  |  |  |  | $8 \cdot 907$ |  | 94 |  |  |  |  |  |  |  | 64 |
| 65 | 36 |  |  |  |  | 3542 |  |  |  | 64.343 |  |  |  |  | 121 | 139 | 158 | 177 |  |  |  |
| 66 | 357 | 35 | 35 |  |  | 34 | 341 | \|3389 | 3361 | 65•33 |  | 2044 | ${ }^{223}$ |  |  |  |  |  |  |  | 66 |
| 67 | 734 | 343 |  |  |  | 3343 |  | 32 | 32 | $66 \cdot 3$ |  | 3439 | 3632 |  | 401 | 4211 | 440 | 459 |  |  |  |
|  |  |  |  |  | 32 |  |  | 31 | 31 | 67.31 | 946 | 4834 |  |  | 54 | 5617 | 58 | 600 | 62 |  | 68 |
| 70 |  | 3159 | 3131 |  |  |  |  |  | 3060 <br> 295 |  | 9.7421 | $\begin{array}{\|l\|l\|} \hline 628 \\ 7622 \end{array}$ | $\begin{aligned} & 6427 \\ & 7824 \\ & \hline 62 \end{aligned}$ | $\begin{aligned} & 662 \\ & 802 \end{aligned}$ |  |  |  |  |  |  | 69 |
|  |  |  |  |  |  |  | 297 | 2888 |  | 70282 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 28 |  |  | $71 \cdot 27$ | 10.02 | 04 |  |  | 103 |  | 14 |  | 18 |  |  |
|  |  |  |  |  |  |  | 2717 |  |  |  | 10. |  |  | 22 | 243 |  |  |  |  |  | 73 |
| 74 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 仡 |
| 75 | 52701 |  |  |  |  |  |  |  |  | 74.24 | 10.43 |  |  |  |  | - |  |  |  |  | 75 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
|  | 250 | 2475 |  | 2413 | 2381 | 2350 |  |  |  | 76.22 |  |  |  |  |  |  |  |  |  |  | 77 |
| 78 |  | ${ }_{228}^{237}$ |  |  | 2183 | 2250 | ${ }_{2119}^{2218}$ | 2186 | 2154 |  | 10 |  |  | ${ }_{062} 92$ | ${ }^{945}$ |  | 9903 1312 |  |  |  | 78 |
| 80 | 2214 | 2182 | 150 | 211 | 2084 | 2052 | 2019 | 1986 | 1953 | $79 \cdot 192$ | 11.1338 | 1563 | 179 | 203 | 226 | 249 | 1 | 295 | 118 |  | 80 |
|  |  | 20 |  | 20 | 1985 | 1952 | 19 | 1886 | 18 |  | $1{ }^{1}$ | 2964 | 319 | 34 |  |  | 430 |  |  |  |  |
|  | 22 | 1987 | 1 | 182 | 17 | 18 | 18 | 1786 | 175 |  | 11.4 | 43 | 4594 | 48 | 506 | 5303 | 5539 | 5775 |  |  |  |
|  | 192 | 18 | 18 | 182 | 17 | 17 | 17 | 1686 | 1651 | $82 \cdot 16$ | 11.55 | 57 |  |  | 647 | 6709 | 6948 | 7187 |  |  |  |
|  |  | 17 |  | 172 |  |  | 162 | 158 |  | $83 \cdot 1$ |  |  |  |  | 787 | 811 | 83 |  |  |  |  |
| 85 | 1 | 1693 | 1659 | 1624 | 1590 | 1555 | 1520 | 1485 | 1450 |  | 11.82 | 854 | 8787 |  | 9276 | 9521 | 9766 | 401 |  |  |  |
|  | 163 |  |  |  |  |  | 142 | 1385 | 1350 | $85 \%$ | 11.96 |  |  |  | 068 | 0927 | 117 | 142 |  |  |  |
|  | 153 | 14 | 14 | 142 | 13 | 13 | 13 | 1285 | 1248 | $86 \cdot 1$ | 12.10 | 13 |  |  | 208 | 2333 | 258 | 283 |  |  |  |
| 888 88 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 88 |
| 90 | 1241 | 120 | 116 | 1 | 1095 | 105 | 1021 | 0984 | 09 | 89.09 | 12.52 | 55 | 577 | 603 | 62 | 6552 |  | 7070 | 7329 | 75 | 8 |
|  | 1144 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7958 | 8220 | 8482 |  |  |  |
|  | 10 | 100 | 09 | 09 |  | ${ }^{08}$ |  |  |  |  |  |  |  |  |  | 077 | 10 | 9894 |  |  |  |
|  |  |  |  |  |  |  |  | 06884 |  | ${ }_{92} 92.0506$ | lis $\begin{aligned} & 12.9431 \\ & 13.0823\end{aligned}$ | 108 | 136 | 163 | 1906 | ${ }_{217}$ | 24 |  |  |  | 93 |
| 95 | 075 | 071 | 067 | 06 | 0600 | 0561 | 05 | 0483 | 044 | 94.0405 | 13:2214 | 248 | 276 | 30 | 3309 | 3583 | 3856 | 413 | 4403 |  | 95 |
|  | 065 | 06 |  |  |  | 0462 | 0423 | 0383 | ${ }^{0344}$ | 95.030 | 13.3606 | 3883 | 4159 | 4436 | 4712 | 4989 | 5265 | 5542 |  |  |  |
|  | 050 | 05 |  |  |  | 0363 | 0323 | 02 | 02 |  | 13 |  |  |  | 611 | 639 | 6674 | 69 |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 98.00 | 13.6 13.7 |  |  |  | ${ }_{8922}^{7519}$ |  |  |  |  |  | 88 |
| 100 | - 00 | 0228 | 0187 | 14 | ${ }^{0} 1061$ | 65 | 024 | 983 | 942 | 98.990 | 13.9173 | 9461 | 974 | ${ }^{83}$ | ${ }^{8325}$ | 0613 | 0901 | 1189 | 1477 |  |  |
|  | $60^{\prime}$ | 59' | 58 | $57^{\prime}$ | $56^{\prime}$ | 55 | $54^{\prime}$ | $53^{\prime}$ | 52' | $51^{\prime}$ | $60^{\prime}$ |  | $58^{\prime}$ | 57 |  | $55^{\prime}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $8^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $8^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $11{ }^{\prime}$ | $12^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | ｜ $16{ }^{\prime}$ | 117 | $18^{\prime}$ | 1 19， | 1 | $11^{\prime}$ | $12^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $\left\|5^{\prime}\right\|$ | $\left.16^{\prime}\right]$ | $17^{\prime}$ | 18 |  |  |
|  | 98 | 9898 | 9898 | 9897 | 9897 | 9897 | 9896 | 9896 | ｜9895 | ． 9895 | 142 | 1423 | 1426 | 1429 | 1432 | 1435 | 1438 | 1441 | 1444 |  | 1 |
|  | 979 | 979 | 979 | 979 | 9794 | 97 | 979 | 97 | 979 | 1.9790 | 28 | 28 | 28 | 2858 | 2864 | 287 | 2876 | 2881 | 2887 | 2893 | $2$ |
|  | 969 | 969 | 9693 | 96 | 969 | 9690 | 9688 | 687 | 9686 | 968 | 426 | 4270 | 4279 | 428 | 4296 | 430 | 4313 | 4322 | 433 | 43 | 3 |
|  | 9594 | 9593 | 959 | 958 | 95 | 9586 | 9584 | 9583 | 98 | $3 \cdot 9$ | 5682 | 5694 | 5705 | 5717 | 5728 | 5740 | 5751 | 5763 | 5774 | 5786 | 4 |
|  | 94 | 仡 | 9489 |  |  |  |  |  |  |  |  |  |  |  |  |  | 7189 | 7203 | 7218 | 7232 | $\begin{array}{r} \\ 8 \\ \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ \hline\end{array}$ |
|  | 9392 | 9389 | 9387 | 9384 |  | 9379 | 9377 | 9374 | 9372 | 59369 | 523 | 8540 | 8558 | 8575 | 8592 | 8610 | 8627 | 8644 | 8661 | 867 |  |
|  | 929 | 928 | 92 |  |  | 9276 | 927 | 9270 | 926 |  |  | 99 | 99 | ＋ | 0024 | 0044 | 0065 | 0085 | 5 | 012 |  |
|  | 9189 | 9185 | 9182 | 917 | 9175 | 9172 |  |  | 9162 |  |  | 13 | 141 | 1433 | 1456 | 1479 | 1502 | 1525 | 1548 | 157 |  |
|  | 908 | 908 |  |  |  | 9069 | 9065 |  | 9057 |  |  | 281 | 2837 | 286 | 2888 | 291 | 2940 | 2966 | 298 | 3018 |  |
| 10 | 8986 | 8982 | 8978 | 8973 | 8969 | 8965 | 8961 | 885 | 8953 | 9.8948 | － 4205 | 4234 | 4263 | 4292 | 432 | 434 | 4378 | 4407 | 443 | 446 | 0 |
| 11 | 888 | 8880 | 8875 | 8871 |  |  | 8857 |  | 88 |  | 1.5626 | 5658 |  |  |  |  |  |  |  |  |  |
| 12 | 878 |  | 8 |  |  | 8758 | 8753 | 8 | 874 | 11.873 | 046 |  |  | 750 | 7185 | 7219 |  | 7288 |  |  |  |
| 13 | 868 | 867 | 867 | 8666 | 8660 | 865 | 8649 | 8644 | 8638 | 12.8633 | 8467 | 850 | 85 | 85 | 861 | 865 | 86 | 87 | 8766 |  | 3 |
| 14 | 8580 | 857 |  |  |  | ， | 8545 |  | 8534 | 13.8528 |  | 9928 |  | ＋008 | 0049 | 008 | 012 | 0170 | 0210 | 025 | 14 |
| 15 | 8479 |  |  |  | 8454 | 48 |  | 8435 | 29 | 342 | $2 \cdot 1308$ | 1351 | 1394 | 1438 | 1481 | 152 | 1567 | 1610 | 653 | 1697 | 15 |
| 16 | 837 | 8371 | 8364 | 8358 | 8351 | 8344 | 8338 | 8331 | 8324 | 15.8317 | 2.2728 | 2775 | 2821 | 2867 | 2913 | 2959 | 3005 | 3051 | 3097 | 3143 | 16 |
| 17 | 827 | 8269 | 82 | 8255 |  | 82 | 8234 |  |  | 16.82 | 4149 |  | 42 | 4296 | 434 | 43 | 44 |  |  |  | 7 |
| 18 | 8175 |  |  |  |  | 8137 |  |  | 8115 | 1781 | 2.5570 | 5621 | 56 | 5725 | 5777 | 5829 | 5880 | 5932 | 5984 | 603 | 18 |
| 19 | 8073 | 80 | 8057 | 80 | 42 | 8034 | 8026 | 8018 | 8010 |  |  | 7045 | 70 | 7154 | 72 | 72 | 7318 | 7373 | 7428 | 748 | 19 |
| 20 | 7972 | 7964 | 795 | 7947 | 7939 | 7930 | 7922 |  | 05 | 19.7897 | 2841 | 8468 | 8526 | 8583 | 864 | 869 | 87 | 8814 | 887 | 892 | 20 |
| 21 | 78 | 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 21 |
| 22 | 776 | 77 |  |  |  |  |  |  |  |  |  |  |  |  | 150 |  |  |  |  |  | 22 |
| 23 | 766 | 76 | 76 | 7639 | 7629 | 76 | 7610 | 760 |  | $22 \cdot 75$ | 3.26 | 2738 | 28 | 2871 | 293 | 300 | 30 | 3136 | 3202 |  | 23 |
| 24 | 75 | 755 |  |  |  |  | 7506 |  |  | ， | 3.4 | 416 | 42 | 4300 | 43 | 44 | 4507 | 4576 | 4645 | 471 | 24 |
| 25 | 746 | 745 |  | 7434 | 7423 | 13 | 7402 | 7392 | 7381 | 4737 | 3.5513 | 5585 | 5657 | 572 | 580 | 587 | 59 | 60 | 6089 | 616 | 25 |
| 26 | 736 | 7353 | 7342 | 7331 | 7320 | 7309 | 7298 | 7288 | 7277 | 25.726 | 3．6934 | 7009 | 7084 | 7158 | 7233 | 7308 | 7383 | 7458 | 7533 | 760 | 26 |
| 27 | 726 | 725 |  |  |  | 7206 | 7195 |  |  |  |  |  |  |  | 86 |  |  |  |  |  | 27 |
| 28 | 716 | 714 |  |  | 7114 | 7102 | 709 |  |  |  |  |  |  | ＋017 |  |  | 025 |  | 0420 |  | 28 |
| 29 | 70 | 704 | 703 |  |  |  | 6987 |  |  | 9950 | 4.11 |  | 1362 | 144 | 15 | 16 | 16 | 1780 | 1863 |  | 29 |
| 30 | 6958 | 6945 | 6933 | 6920 | 6908 | 6895 | 6883 | 6870 | 6858 | 29.6845 | 4261 | 2702 | 2789 | 287 | 2961 | 3048 | 3134 | 3221 | 3307 | 339 | 30 |
| 31 | 68 |  |  |  |  |  |  |  |  |  | $4 \times 4036$ |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 675 | 67 | 67 |  |  |  |  |  |  | 31.66 | 4.545 |  | 564 | 573 | 5826 | 5918 | 6010 | 2 |  |  | 32 |
| 33 | 66 | 66 | 66 | 6612 | 6599 | 6585 | 657 |  | 6544 | $32 \cdot 653$ | 687 |  | 7068 |  | 72 |  |  |  |  |  | 33 |
| 34 | 655 | 653 |  |  | 6496 |  | 646 |  |  | $33 \cdot 64$ | 82 |  | 349 |  | 869 |  | 8885 | 8983 | 908 | 917 | 34 |
| 35 | 645 | 643 | 64 | 6407 | 393 | 6378 | 6363 | 6349 |  | 34．6319 | －9719 |  | 9920 | 10 |  | 0222 | 0323 | 0424 | 052 | 062 | 35 |
| 36 | 63 | 6334 | 6319 | 6304 | 6290 | 6275 | 625 | 6244 | 622 | 35.6214 | $5 \cdot 1139$ | 1243 | 1346 | 1450 | 1554 | 1657 | 1761 | 1865 | 1968 | 2072 |  |
| 37 | 62 |  |  |  |  |  |  |  |  |  | 180 |  |  |  | 2986 | 3092 | 3199 |  | 3412 | 518 | 37 |
| 38 | 614 | 61 | 61 |  |  | 6068 | 6052 |  |  | $37 \cdot 600$ | 5.3980 | 409 | 4199 | 430 | 44 | 452 | 46 | 4746 | 4855 | 496 | 38 |
| 39 | 60 | 60 |  |  |  |  |  |  |  | 38．589 |  |  | 5625 | 573 |  | 59 | 607 | 6187 | 6299 |  |  |
| 40 | 594 | 5927 |  | 5894 | 5877 | 5861 | 5844 | 5827 | 5810 | 39．579 | 5821 |  | 7052 | 7167 | 7282 |  | 7512 | 762 | 7742 | 85 | 40 |
| 41 | 58 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 57 | 57 | 57 |  |  | 5654 |  |  |  | 41 |  |  |  | ＋02 |  |  |  |  |  |  | 42 |
| 43 | 56 | 56 |  |  | 5568 | 5550 | 5532 |  | 5496 | 42.54 | 108 | 1207 | 1330 | 145 | 15 | 1702 |  | 1949 | 2073 | 219 | 43 |
| 44 | 553 | 55 |  |  |  | 54 | 542 | 5410 |  | 3.53 | 25 | 26 | 27 | 28 | 30 | 31 | 32 | 3390 | 3517 | 364 |  |
| 45 | 5437 | 54 | 53 | 5381 |  | 53 | 5324 |  |  | 44.526 | 39 | 40 | 4183 | 4313 | 44 | 45 | 470 | 483 | 4960 | 509 |  |
| 46 | 5335 | 5316 | 5297 | 5278 | 5259 | 5240 | 5220 |  |  | 45.5163 | 6.5344 | 547 | 5609 | 5742 | 5874 |  | 6139 | 6271 | 6404 | 653 | 46 |
| 47 | 52 | 52 |  |  |  |  |  |  |  | $46 \cdot 50$ | 67 |  | 7036 | 7171 | 7306 |  |  |  |  |  |  |
| 48 | 513 | 51 | 50 |  |  |  |  |  |  | 47 |  |  |  | 860 |  |  |  |  |  |  | 48 |
| 49 | 503 |  |  |  |  |  | 4 |  | 4 | －48 | 960 |  | 981 | ＋02 | 0170 | 03 | 0452 | 0594 | 0735 | 087 |  |
| 50 | 493 | 490 | 488 | 4867 | 4847 | 4826 | 480 | 478 | 4763 | 49.4742 | 102 | 1171 | 1314 | 458 | 160 | 17 | 890 | 2034 | 2178 | 232 | 50 |
| 51 | 482 | 48 |  | 476 | 4743 | 472 |  |  |  |  | 2 | 25 | 27 | 288 | 303 | 31 | 3328 |  | 362 |  |  |
| 52 | 472 | 47 | 4684 |  |  | 461 |  |  |  |  |  |  | 4167 |  | 446 | 46 |  |  |  |  | 52 |
| 53 | 462 | 46 | 45 |  | 4537 | 451 |  |  |  | $52 \cdot 442$ | $7 \cdot 5288$ |  | 5593 | 574 | 5898 |  | 6204 | 6356 | 650 |  | 53 |
| 5 | 45 |  | 447 | 4457 | 443 | 44 |  |  | 43 | 53 |  |  |  |  | 7331 |  |  |  |  |  |  |
| 55 | 44 |  | 437 |  | 31 | 43 | 4285 |  |  | 54：4216 | 78129 | 8288 | 8446 | 86 | 87 | 8921 | 9079 | 9238 | 9396 | 955 | 55 |
| 56 | 432 | 4298 | 4275 |  | 4228 | 4205 |  |  |  | 55.4111 |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 4220 | 41 | 41 | 41 | 4125 | 41 | 407 |  | 4030 | 56＇400 | 09 | 1134 | 129 |  | 16 |  | 1955 | 219 | 22 | 244 |  |
| 58 | 411 |  | 40 |  | 4022 | 39 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 59 | 40 |  |  |  |  | 38 |  |  |  | $58 \cdot 379$ |  |  |  | 43 | 449 |  |  |  | 5170 | 534 |  |
| 60 | 391 | 389 | 3866 | 38 | 16 | 3791 | 376 | 3741 | 3715 | ＇369 | 8.5232 | 5405 | 5577 | 5750 | 592 | 609 | 626 | 64 | 661 | 678 | 60 |
| 6 | 38 |  |  |  |  |  |  |  |  | 35 |  |  |  |  |  |  |  |  | 8057 |  |  |
|  |  |  |  |  |  | 3584 |  |  |  | 61．348 |  |  |  |  | 87 |  |  |  |  |  |  |
| 63 | 36 | 35 | 35 | 3533 | 3507 | 3480 | 345 | 3428 |  | 62 337 | 94 |  | 98 | ＋03 | 02 | 04 |  | 07 | 094 | 11 |  |
| 6 |  |  |  |  | 3404 | 337 |  |  |  | 63327 | 09 |  |  | 146 | 16 |  |  |  |  |  |  |
| 65 | 340 |  |  |  |  | 3273 |  |  |  | 6431 | 9－2335 |  |  |  |  |  |  |  |  |  | 65 |
| 66 | 330 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
| 67 | 320 | 317 | 315 | 31 | 3094 | 30 | 303 |  |  | 6295 | 9.5176 | 53 | 55 | 57 | 59 | 61 | 63 |  |  |  | 67 |
| 68 |  |  |  |  |  |  |  |  |  | $67 \times 284$ |  |  | 矿 | 7183 | 737 |  |  |  |  |  | 68 |
| 69 | 300 | 297 | 29 |  | 88 | 2859 | 283 | 2802 | 2773 | 68．27 | ． 80 | 82 | 8414 | 8613 | 881 | 90 | 92 | 94 | 9606 | 980 |  |
| 70 | 29 | 287 | 28 | 28 | 2785 | 2756 | 2727 | 269 | 2668 | 69．2639 | 943 | 96 | 984 | ＋04 | 024 | 24 | 06 | 0848 | 104 | 12 | 70 |
| 7 | 28 |  |  |  |  | 2652 | 2623 |  |  | 253 | 10 |  |  |  | 16 |  |  |  |  |  |  |
| 72 | 269 | 26 |  |  |  |  |  |  |  |  |  |  | 263 | 2900 | 3107 |  |  |  |  |  |  |
| 73 | 259 | 256 | 253 | 250 | 2476 | 2446 | 241 | 238 | 2354 | 2.232 | $10 \cdot 369$ | 390 | 4119 | 4329 | 4539 | 475 | 49 | 5170 | 538 | 55 |  |
| 74 |  |  |  |  |  | 2342 |  |  | 234 | 73.2218 | 10.511 | 5332 | 5545 | 5758 | 597 | 有 | 639 | 6 | 682 | 硣 | 74 |
| 75 | 239 | 2363 | 2332 | 2301 | 2270 | 2239 |  |  |  | 74．2113 |  |  | 697 |  | 740 |  | 783 | 805 | 826 | 848 | 75 |
| 76 | 229 | 22 | 2230 | 2198 |  |  |  |  |  |  | 10 | 817 | 839 | 8617 | 8836 | 905 | 9273 | 492 |  | 929 | 76 |
| 77 | 219 | 21 | 21 | 2096 | 2064 | 2032 | 19 | 196 | 1935 | $76 \cdot 190$ | 10.938 | 960 | 9824 | ＋046 | 0268 | 04 | 07 |  | 115 |  | 77 |
| 78 | 209 | 20 |  |  |  |  | 189 |  | 130 |  | 11.080 | 102 | 1 | 1475 | 170 | 192 | 148 | 237 |  | 282 | 78 |
| 79 | 198 | 195 | 1923 | 18 | 1858 | 1825 | 1792 | 1758 | 1725 | 78.1692 | $11 \cdot 2222$ | 2449 | 2677 | 2904 | 3132 | 335 | 3587 | 3814 | 404 | 42 | 79 |
| 80 | 1887 | 185 | 1821 | 1788 | 1754 | 1721 | 1688 | 1654 | 1621 | 79＇1587 | 11.364 | 3873 | 41 | 43 | 45 | 47 | 5024 | 5255 | 5485 | 571 | 80 |
| 81 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 168 | 165 | 1616 |  | 1548 | 151 | 1483 |  |  | $81 \cdot 1377$ | 11 | ， | 6956 | 792 | 742 | 仡 | 7900 | 813 | 837 | － | 82 |
| 83 | 148 | 1489 | 15 | 1480 | 1445 | 1411 | 1376 | 1341 | 1306 | $82 \cdot 1272$ | 11.790 | 8143 | 838 | 862 | 88 | 90 | 93 | 95 | 981 | －0 | 83 |
| 84 | 1482 | 1447 | 1412 |  |  |  | 1276 |  | 202 | $83 \cdot 116$ | 11.932 | 咗 | 880 | drs | 29 | 538 | 776 | 1017 |  | 501 | 84 |
| 85 | 13 | 134 | 1310 | 127 | 1239 | 120 | 116 | 13 |  | 84．106 | 12.074 | 099 | 123 | 147 | 172 | 196 | 221 | 2458 | 270 | 294 | 85 |
| 86 | 127 | 1243 | 08 | 1172 | 1136 | 110 | 106 | 1028 | 0992 | 85．0956 | 12.21 | 241 | 266 | 2908 | 315 | 340 | 36 | 3899 | 414 | 43 | 86 |
| 87 | 1 | 14 | 1105 | 1069 | 1033 |  | 085 | ， | 288 | 86.085 | 12.358 | 383 | 4087 | 433 | 458 | 483 | 5 | 5348 |  |  |  |
| 88 | 1076 | 104 | 1003 | 0967 | 0930 | 0893 | 085 | 028 | 0783 | 87.074 | 12.500 | 526 | 5513 | 576 | 602 | 6273 | 6527 | 678 | 7033 | 728 | 88 |
| 89 | 275 |  |  | 0864 |  |  | 0753 | 0715 | 0678 | 88.064 | 12.6427 | 6683 | 6940 | 7196 | 7452 | 770 | 796 | 822 | 8477 | 873 | 89 |
| 90 | 0873 | 0836 | 0799 | ， | 724 | 0686 |  | 析 | 0573 | 89.0535 | 84 | 81 | 836 | 86 | 88 | 9143 | 9402 | 9662 | 992 | －18 | 90 |
|  | 0772 | 0734 | 0696 | 599 | 521 | 58 | ¢ |  |  |  |  |  | 析 |  | 0316 | 2 | 840 | ， | 208 |  |  |
|  | 067 | 0632 | － | 0556 | 18 | 0479 | 044 | 0402 | 0364 | 91.0325 | 13.068 | 095 | 1219 | 1483 | 174 | 201 | 22 | 254 | 28 | 307 | 92 |
| 93 | 056 | 05 | 0492 | 0453 | 0415 | ， | 033 | 029 | 0259 | 92.0220 | 13.210 | 237 | 2645 | 2913 | 3180 | 348 | 51 | 3984 | 4251 | 451 | 93 |
| 94 | 0467 | 0429 |  | 0351 | 0312 | 027 | 023 | 019 | 0154 | 93.0115 | 13.3530 | 3801 | 4071 | 4342 | 461 | 488 | 51 | 5424 | 5 |  |  |
| 95 | 03 |  |  |  |  |  |  |  | 5 | 94.0010 | $13 \cdot 4950$ | 5224 | 5497 | 577 | 60 | 63 | 65 | 686 | 71 | 741 | 95 |
|  | 0265 | 23 |  |  |  |  | －025 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 97 | 0163 | 0123 |  |  | －002 | 9 | 9921 | 9776 | 9840 | 95.9799 | 13＇7792 | 8071 | 8350 | 8629 | 8909 | 9188 | 9467 | 9746 | ＋026 | ， |  |
|  | 0062 | －021 | 9981 |  |  | 98 | 9817 | 9776 | 9735 | 96.9694 | 13.9212 | 9494 | 9776 | ＋058 | 0341 | 0623 | 0905 | 118 | 148 |  | 98 |
|  | 996 |  |  |  |  | 9755 | 9714 | 967 | 963. | 97.9589 | 14.0633 | 0918 | 1203 | 1488 | 1773 | 2058 | 2343 | 2628 | 293 | 18 | 99 |
| 100 | 9859 | 9818 | 9776 | 9735 | 9693 | 9651 | 9610 | 9568 | 9526 | 98．9484 | 14．2053 | 2341 | 2629 | 2917 | 3205 | 3493 | 3781 | 4068 | 4356 | 4644 | 100 |
|  | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | $4{ }^{-1}$ | $46^{\prime}$ | 45 | 44 | 43 | $42^{\prime}$ | $41^{\prime}$ | （1） | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | $46^{\prime}$ | $45^{\prime}$ | $44^{\prime}$ | 43 | $42^{\prime}$ | 41＇ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 8 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | 8 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | $21^{\prime}$ | $22^{\prime}$ | 23 | $2{ }^{\prime}$ | $25^{3}$ | 26 | $27^{\prime}$ | 28 | $29^{\prime}$ | 20 | $2{ }^{\prime}$ | $22^{\prime}$ | $23^{\prime}$ | 24 | $25^{\prime}$ | $26^{\prime}$ |  |  | 29 |  |
|  | 9894 | 9894 | 98 | 9893 | 9893 | 9892 | 9892 | 9891 | 9891 | 9891 | 1449 | 1452 | 145 | 145 | 1461 | 146 | 1467 | 1469 | 1472 | 1475 |  |
|  | 978 | 9788 | 9787 |  | 9785 | 9785 |  | 97 | 978 | 1.97 | 2899 |  | 29 | 29 | 292 | 292 | 2933 | 293 | 2945 | 2950 |  |
|  | 9683 | 9682 | 9681 | 9679 | 9678 | 9677 |  | 9674 | 9673 |  | 34 | 43 | 4365 | 4374 | 4382 | 4391 | 4400 | 4408 | 4417 | 4426 |  |
|  | 9578 | 9576 | 9574 | 9573 | 9571 | 956 | 956 | 9566 | 9564 |  | 5797 | 5809 | 5820 | 5832 | 5843 | 58 | 58 | 5878 | 5889 | 5901 |  |
| 5 | 9472 | 9470 | 9468 | 9466 | 9464 |  | 9459 | 9457 |  |  | 7247 | 7261 | 727 | 7290 |  | 7319 | 733 | 7347 | 336 | 737 |  |
| 6 | 93 | 93 | 9361 | 9359 |  |  |  |  | 9346 | 5.9344 |  | 8713 | 8730 | 8748 | 8765 | 9782 | 8800 | 8817 | 8834 |  |  |
|  | 926 | 9258 |  |  |  |  |  |  |  |  | 15 | 0165 | 01 |  | 0226 |  |  |  |  |  |  |
|  | 9155 | 9152 | 9149 | 9145 | 9142 | 9138 |  | 2 | 912 |  | 1505 | 1618 |  | 1664 | 1687 | 17 | 173 | 1756 | 1779 | 1802 |  |
|  |  |  |  |  |  |  |  |  | 9019 | 8.9015 |  | 3070 | 309 | 3122 | 3147 | 3173 | 319 | 3225 | 3251 |  |  |
| 10 | 894 | 8940 | 8936 | 8931 | 8927 | 8923 | 8919 | 14 | 8910 | 9.8906 | 4493 | 4522 | 4551 | 4580 | 4608 | 4637 |  | 695 | 472 | 4752 |  |
| 11 | 883 | 88 | 8829 | 8825 | 8820 | 8815 | 8811 | 8806 | 8801 | 10 | 1.5943 | 5974 | 60 | 6037 | 60 | 610 | 6132 | 5164 | 6196 | 22 |  |
| 12 | 873 | 8728 | 87 | 18 | 871 |  | 8702 | 8697 | 8692 | 11.8 |  | 74 | 74 |  | 75 | 7564 |  | 7634 |  |  |  |
| 13 | 862 |  |  | 8611 | 860 |  |  | 8589 | 8583 | 12. |  | 8879 | 89 | 89 | 89 | 9028 | 9066 | 91 | 9140 | 178 |  |
| 14 | 8522 | 8516 | 8510 | 8504 | 8498 | 8492 | 8486 | 8480 | 847 | 13 |  | 037 | 03 | 04 | 0452 | 04 | 0532 | 2 | 0613 | 065 |  |
| 15 | 8418 |  |  |  |  |  |  |  |  |  | $2 \cdot 1740$ |  | 1826 | 1869 | 191 | 195 | 1999 | 2042 | 208 | 2128 |  |
| 16 | 8311 |  |  |  |  | 8277 | 8270 |  | 8256 | 15．824 |  |  |  | 3327 | 3373 |  |  |  |  |  |  |
| 17 | 820 |  | 8191 | 8184 |  | 8169 |  | 8155 | 8147 | 16．814 |  |  | 47 |  | 4834 |  |  |  |  |  |  |
| 18 | 809 | 80 | 80 | 8077 | 806 | 806 |  | 8046 | 8038 | 17 | 26088 | 6140 | 6191 | 62 | 6295 | 6347 | 6399 | 645 | 650 | 655 | 18 |
| 19 |  |  |  | 7970 | 796 |  |  | 7937 | 7929 | 18.792 | $2 \cdot 7537$ | 7592 | 76 |  | 7756 | 7810 |  | 7920 | 7974 | 802 |  |
| 20 | 7888 | 7880 | 71 | 63 | 7854 | 7846 | 7837 | 29 | 20 | $19 \cdot 781$ | 2．8986 | 9044 | 9102 | 92 | 9217 | 9274 | 9332 | 388 | 9447 | 550 | 20 |
| 21 | 77 | 77 | 7765 | 7756 | 7747 | 7738 | 7729 | 7720 | 7711 | 20 | ． 043 | 0496 | 0557 | 06 | 0677 | 0738 | 0798 | 0859 | 0919 | 980 |  |
| 22 | 767 | 76 | 7659 |  |  |  |  |  | 762 | 21.75 |  |  |  |  | 2138 | 22 | 2265 |  |  | 245 | 22 |
| 23 | 757 | 756 |  |  |  |  |  |  | 7493 | $22 \cdot 7$ |  |  |  |  |  |  | 3731 | 3798 |  | 933 |  |
| 24 | 746 | 74 | 7446 | 7436 | 7425 | 741 |  |  | 7384 | 23.7 | 3.478 | 485 | 49 | 49 | 5060 | 51 | 51 | 5267 | 5336 | 540 |  |
| 25 | 7360 | 7350 |  |  | 7318 |  |  |  | 7275 | 4.7 | 3.6233 | 6305 | 63 | 64 |  | 659 | 66 | 6737 | 6809 | 6880 | 25 |
| 26 | 72 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 27 | 714 | 71 |  |  |  |  |  |  |  |  |  |  |  |  | 94 |  |  |  |  |  |  |
| 28 | 70 | 70 |  |  | 699 | 698 |  |  | 6948 | $27 \cdot 693$ | 4.05 | 0662 | 07 | 0823 |  |  | 1064 | 1145 | 1226 | 130 | 28 |
| 29 | 693 |  | 6914 | 6901 |  |  |  |  | 6839 |  |  |  | 2197 |  | 2364 | 2448 |  | 2614 | 69 | 278 |  |
| 30 | 6832 | 6820 | 6807 | 94 | 678 | 676 | 6756 | 43 | 673 | 29 | －3480 | 3566 | 365 | 37 | 382 | 3911 | 399 | 4084 | 417 | 425 | 30 |
| 31 | 672 | 6714 | 6701 | 6688 | 6674 | 666 | 6648 | 6635 | 6622 | $30 \cdot 660$ | $4 \times 492$ | 5018 | 510 | 5197 | 528 | 537 | 5464 | 5553 | 5643 | 573 |  |
| 32 | 662 | 66 | 6594 | 658 |  |  |  |  |  |  |  |  |  |  | 6747 |  |  |  | 115 |  | 32 |
| 33 | 6516 | 65 | 6488 | 647 | 646 | 64 |  | 6418 | 6404 |  | 4 |  |  |  | 8207 |  | 8397 |  | 8587 | 868 |  |
| 34 | 6410 | 63 | 6381 | 636 | 635 | 6338 |  | 6309 | 6295 |  | $4 \cdot 927$ | 937 | 9473 | 9570 | 9668 | 976 |  | 9962 | －060 | 015 | 34 |
| 35 | 6305 |  | 6275 |  |  |  |  |  |  | 34.617 | 5.0726 | 0827 | 0928 | 1028 | 11 | 1230 | 1330 | 1431 | 53 | 1633 | 35 |
| 36 | 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 37 | 609 |  |  |  |  |  |  |  |  |  | 5 |  |  |  |  |  |  |  | 4477 | 458 |  |
| 38 | 59 | 59 |  | 5940 | 592 |  |  |  |  | 37.584 | $5 \cdot 50$ |  |  | 5402 | 5512 |  |  | 5840 | 5949 | 605 |  |
| 39 | 5882 | S8 |  | 5833 | 5816 | S80 | 5783 | 5 | 5750 | 38．573 | － |  |  | 68 | 69 |  |  |  | 721 | 53 |  |
| 40 | 577 | 576 | 43 | 572 | 570 | 5692 | 5675 | 5658 | 564 | 39.562 | 5.797 | 80 | 82 | 8318 | 843 | 85 | 86 | 8779 | 889 | 200 |  |
| 41 | 56 | 565 |  |  | 5602 | 558 | 5567 | 5549 | 5532 | $40 \cdot 551$ | 5.942 |  |  | 9776 |  | ＋012 |  | 0248 |  |  |  |
| 42 | 55 |  |  | 5512 | 549 |  |  |  |  | 41．54 |  |  |  |  |  |  |  |  | 838 |  |  |
| 43 | 546 | 54 | 5424 | 5405 |  |  |  |  |  | 42.52 | 6.2321 |  |  |  | 281 |  |  | 187 | 33 |  |  |
| 44 | 535 | 53 | 5317 | 529 |  |  |  | 5224 |  |  | $6 \cdot 3770$ |  | 4023 |  | 427 | 4403 |  | 4656 | 4783 |  |  |
| 45 | 5249 | 5230 | 5211 | 5192 | 5173 | 515 |  | 5115 |  | $44 \cdot 507$ | 6.5219 | 5349 | 5478 |  | 5737 | 5867 |  | 6126 | 255 | 638 |  |
| 46 | 51 | 5124 |  | 5085 | 5065 |  |  |  |  | 45＊496 |  |  |  |  |  |  |  |  |  |  |  |
| 47 | 503 | 50 | 49 | 497 | 495 | 493 | 4918 | 488 |  | 46.4 | $6 \cdot 81$ |  |  |  | 86 | 87 |  |  | 20 | 砣 |  |
| 48 | 493 | 4912 |  | 487 | 485 | 4830 | 4810 | 4789 | 476 | $47^{\circ} 4748$ | 95 |  |  |  | －120 | 025 |  | 0534 | 067 |  |  |
| 49 | 482 | 4806 | 885 | 4764 | 474 | 423 | 210 | 881 | 4660 | 48 | 7•1017 |  | 129 | 1440 | 158 | 172 | 1863 | 200 | 214 |  |  |
| 50 | 472 | 470 | 4679 | 4657 | 463 | 4615 | 459 | 4572 | 4551 | 49 | 7.2466 | 261 | 275 | 2898 | 304 | 318 | 3329 | 34 | 3617 | 376 |  |
| 51 | 461 | 45 | 4572 |  |  | 4507 |  |  | 44 |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 451 |  |  | 4444 | 4422 | 43 | 4377 |  | 4 | 51.43 | 7.53 |  |  |  | 59 | 6113 |  | 6412 | 656 |  |  |
| 53 | 44 | 4382 | 43 | 43 | ， | 429 | 4269 | 424 | 422 | 52.420 | $7 \cdot 68$ |  |  | 7272 | 742 | ， | 772 | 88 | 303 |  |  |
| 54 | 42 | 4276 | 4253 | 42 |  |  | 4161 | 4138 | 411 | 53.409 | 7.82 |  |  |  | 888 | 904 |  | 9351 |  |  |  |
| 55 | 4193 | 4170 |  | 4123 |  |  | 4053 | 4029 | 4006 | 54．3982 | 7.9713 | 9871 | －029 | 0187 | 0346 | 0504 |  | 822 | 079 | 113 | 55 |
|  | 4087 |  |  |  |  |  |  |  |  | $55 \cdot 387$ |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 39 | 3958 | 3934 | 39 |  |  |  |  |  | 56．37 | 8.26 |  |  |  |  |  |  |  | 392 |  |  |
| 58 | 38 |  |  | 38 |  |  |  |  |  | 36 |  |  | 4396 | 4561 | 472 | 489 |  | 528 |  |  |  |
| 59 |  | 3746 | 3721 | 369 |  |  |  |  | 357 | 58．35 | 8.55 |  | 58 | 6019 | 618 | 635 | 6529 | 669 | 686 | 703 |  |
| 60 | 36 | 3640 | 3614 | 358 |  | 3538 | 3512 | 3487 |  | 59.3435 | \％ | 7132 | 7305 |  |  | 782 |  | 8168 | 8340 | 8513 |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  | 61.3216 |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 33 | 3322 | 3295 | 32 | 3242 | 3215 | 3188 | 316 | 313 | 62 | $9 \cdot 13$ | 14 | 167 | 185 | 203 | 22 |  | 257 | 275 | 293 |  |
| 64 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 349 | 367 |  |  | 4230 |  |  |
| 65 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 29 | 2898 | 286 |  |  |  |  |  |  | $6 \cdot 26$ |  |  |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 69 |  |  | 2656 | 262 | 259 | 2569 | 539 | 2510 | 248 | 68.245 | 10.00 | 02 | 0400 | － | 079 | 09 | 1194 | 139 | 1591 |  |  |
| 70 | 26 | 2580 | 2550 | 2520 | 2491 | 2461 | 2431 | 2401 | 2371 | 69.2341 | $10^{\circ}$ | 1654 | 1855 | 2057 | 2258 | 2460 | 2661 | 2862 | 3064 | 326 |  |
| 7 | 250 | 2474 |  | 2414 |  |  |  |  | 2262 | ， | 10.29 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5180 |  |  | 砛 |  |  |  |
| 73 | 22 | 2262 | 2231 | 220 | 2169 | 2138 | 2107 | 207 | 204 | 2013 | 10.58 | 60 | 62 | 643 | 66 | 68 | 70 | 727 | 748 |  |  |
| 74 | 21 | 2156 | 2124 |  |  |  |  | 1967 | 1935 | 103 | 10 | 7463 | － |  | 8101 | 831 | 852 |  |  |  |  |
| 75 |  |  |  |  |  |  |  |  | 1825 | 74．179 |  | 89 | 13 | 93 | 956 | 977 | 999 | －210 | 04 |  |  |
| 76 | 1976 |  |  |  |  |  |  |  |  |  |  |  |  |  | 1023 | 24 | 1460 | 167 | 189 |  |  |
| 77 | 187 | 1838 | 180 | 177 | 1740 |  |  | 164 | 16 | 76．157 | $11 \cdot 15$ | 1819 |  |  | 24 | 27 | 2927 | 314 | 3370 |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 11304 | 3271 | 矿 |  | Stis | 163 | 析 | ， |  |  |  |
| 79 | 165 | 1626 | 1592 | 15 | 1525 | 1492 | 1458 | 142 | 1390 | 78．13 | 11.449 | 4724 | 495 | 517 | 54 | 5633 | 5860 | 608 | 631 | 65 |  |
| 80 | 1553 | 1520 | 148 | 145 | 14 | 138 | 1350 | 131 | 1281 | 79．1247 | 11.5946 | 6176 | 6406 | 663 | 8866 |  |  | 7557 | 7787 | 801 |  |
| 8 | 1448 | 1414 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 027 |  |  |  |
|  |  |  |  | 1138 | 1 | 1168 |  | 1098 | 1063 |  | 11.88 | 9080 | 9316 | 9552 | 9788 | －024 | 0260 | 0496 | 0732 |  |  |
| 83 | 1237 | 1202 | 116 | 113 | 10 | 1061 | 1025 | 099 | 0954 | 82.09 | 12.0 | 053 | 077 | 101 | 1249 | 1488 | 1727 | 196 | 22 | 24 |  |
| 84 | 1131 |  | 1060 | 1024 |  | 593 |  |  |  |  |  | ¢88 | 228 | 249 | 271 | 215 | 3193 | 3435 |  |  |  |
| 05 | 1 |  | 095 | 0918 | 0881 | 0845 | 0809 | 077 | 0736 | 84．070 | 12.319 | 343 | 368 | 392 | 417 | 441 | 4660 | 4904 | 51 | 539 |  |
| 86 | 0920 | 0883 | 0847 | 0811 | 0774 | 0738 | 0701 | 066 | 10 | 85 | 12 | 48 | 5136 |  | 5631 | 58 | 6126 | 637 | 662 |  |  |
|  | 08 | 077 | 0741 | 0704 | 0667 | 0630 | 0593 | 0556 | 518 | 86 | 12 | 63 | 659 | 68 | 7092 | 73 | 59 | 784 | 809 | 83 |  |
|  | 0709 | 0671 |  |  |  | 0522 | 0485 | 03 | 040 |  |  | 7793 | 804 | 8300 | 8553 | 8806 | 559 | 931 | 956 | 1294 |  |
| 89 | 0603 | 0565 | 052 | 0490 | 0452 | 0415 | 037 | 03 | 0301 | 88.026 | 12.8 | 9246 | 950 | 975 | －01 | 027 | 0526 | 078 | 103 | 129 |  |
| 90 | 049 | 0459 | 0421 | 03 | 0345 | 0307 | 0268 | 0230 | 0192 | 89.015 | 12043 | 0698 | 0957 | 121 | 47 | 173 |  | 225 | 251 | 2770 | 90 |
|  | 03 | 0353 |  | 276 | 023 |  |  | － |  |  |  |  |  |  | 239 | 矿 |  |  |  |  |  |
|  | 0286 | 24 | 210 | －10 | 0131 | 0091 | 0052 | －013 | 9974 | 90.993 | 13.33 | 36 | 386 | 41 | 439 | 46 | 4926 | 5191 | 5455 |  |  |
|  | 018 | 014 | 010 | 006 | ＋023 | 9984 | 9944 | 9904 | 9865 | 91.982 | $13^{\prime} 4787$ | 5054 | 5322 | 5590 | 5857 | 6125 | 6392 | 6660 | 6928 |  |  |
|  | 075 | ， 35 |  |  |  |  | 9836 | 978 | 9756 | 9297 | 13.6236 | 6507 | 6777 | 7048 | 7318 | 7589 |  | 813 | 840 |  |  |
|  | 9970 | 9929 |  | 9849 |  | 9768 | 9728 | 9687 | 9647 | 93.960 | $13 \cdot 7685$ | 795 | 8232 | 8506 | 872 | 052 | 9326 | 9599 | 987 | ＋12 |  |
|  | 9864 | 9823 |  | 9742 | ｜9701 | 9661 | 9620 | 9579 | 538 | 94.9496 | 13.9135 | ， | 9687 | 9963 | － 240 | 05 | 079 | 068 | 1345 |  |  |
|  | 9758 | 9717 | 根 |  | 9594 | 9553 | 9512 | 9470 | 9429 | 析 | 0584 | 0863 | 1142 | 142 | 1701 | 198 | 2259 | 253 | 2817 | 源 |  |
|  | 553 | 961 | 997 | 9529 | 9487 | 9445 | 9403 | 93 | 9320 | $96 \cdot 927$ | 14.2033 | 2315 | 2597 | 287 | 316 | 34 | 37 | 40 | 428 | 457 |  |
|  | 9547 | 950 | 946 | 9422 | 9380 | 9338 | 9295 | 9253 | 9211 | 97.9168 | 14.3483 | 3768 | 4052 | 433 | 4622 | 4907 | 5192 | 5477 | 5762 |  |  |
| 100 | 9442 | 9399 | 9357 | 9315 | 9272 | 9230 | 9187 | 9145 | 9102 | 8．905 | 493 | 5220 | 5508 | 5795 | 6083 | 6371 | 6659 | 6946 | 234 | 522 | 100 |
|  | $40^{\prime}$ | 39 | 38 | 37 | 36 | 35 | $34^{\prime}$ | $33^{\prime}$ | 32 | $31^{\prime}$ |  |  |  | 137＇ | 36 | ｜35＇ | $34^{\prime}$ |  | $32^{\prime}$ | $31^{\circ}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Cos |  |  |  |  |  |  |

TRAVERSE TABLES．

| $8^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $8^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | 31 | 32＇ | 3.3 | $34^{\prime}$ | $35^{\prime}$ | $36^{\prime}$ | 37 | $38^{\prime}$ | 39 | ， | 31 | 32 | $33^{\prime}$ | 34 | $35^{\prime}$ | 36 | 37 | $38^{\prime}$ | 39 |  |
|  | 9890 | 9890 | 9889 | 9889 | 9888 | 9888 | 9888 | 9887 | 9887 | 9886 | $\cdot 1478$ | 1481 | 1484 | 14 | 90 | 1492 | 1495 | 1498 | 1501 | 1504 |  |
|  | 978 | 9779 | 977 | 9778 | 9777 | 977 | 9775 | 寿4 |  | 1.9773 | － 2956 | 2962 | 29 | 29 | 29 | 29 | 29 | 29 |  |  |  |
|  | 9670 | 9669 | 9668 | 9667 | 968 | 9664 | 9663 |  |  |  | 迷 | 4443 | 4452 | 4460 | 4469 | 4477 | 4486 | 4495 | 4503 | 4512 |  |
|  | 956 | 9559 | 9557 | 9555 | 9554 | 9552 | 9550 | 9549 | 9547 |  |  | 5924 | 5935 | 5947 | 5958 | 5970 | 5981 | 5993 |  | 6016 |  |
| 5 | 9451 | 9449 | 46 | 9444 | 9442 | 9440 | 9438 |  | 9433 |  |  | 7405 | 7419 | 7434 | 7448 | 7462 | 747 | 7491 | 7506 |  |  |
|  | 9341 | 9338 | 9336 | 9333 | 9331 |  | 9325 | 9323 | 9320 | 5.9318 | 8869 | 8886 | 8903 | 8920 | 8938 | 8955 | 8972 | 8989 | 9007 | 9024 |  |
|  | 923 |  | 2 | 12 |  | 9216 |  |  |  |  | O347 | 0367 | 038 | O40 | 04 | 0447 | 0467 | 0488 | 0508 | 0528 |  |
|  | 9121 | 9118 | 9114 | 9111 | 9107 | 910 | 910 |  |  |  | 182 | 1848 | 187 | 189 | 19 | 1940 | 1963 | 1986 | 2009 | 203 |  |
|  | 9011 |  |  |  |  | 8920 | 8988 | 8984 | 8980 | －897 | 33 | 3329 | 3355 | 338 | 3406 | 343 | 34 | 348 | 3510 | 353 |  |
| 10 | 8902 | 889 | 8893 | 8889 | 84 | 8880 | 8876 | 71 | 8867 | －8863 | 478 | 4810 | 4838 | 4867 | 4896 | 4925 | 4954 | 4982 | 501 | 5040 | 0 |
| 11 | 87 | 878 | 8782 | 87 | 87 | 8768 | 8763 | 8758 | 8754 | 10 |  | 6291 | 6322 | 63 | 638 | 64 | 6449 | 6481 | 6512 |  |  |
| 12 | 8682 | 8677 | 8672 | 8666 | 86 | 86 |  |  | 184 | 11.863 |  | 72 | 306 | 783 | 78 | 79 |  | 797 | 013 |  | 仡 |
| 13 | 857 | 8566 | 8561 | 8555 | 8550 | 85 | 8538 | 8533 | 527 | 12.852 | 1.9215 | 9253 | 9290 | 932 | 93 | 94 | 9440 | 947 | 9514 | 9552 | 13 |
| 14 | 8462 | 8456 | 8450 | 8444 | 8438 | 843 | 8426 |  | 14 | 13.8408 | 2.0693 | 0734 | 0774 | 0814 | 08 | 08 | 0935 | 097 | 1015 | 105 | 14 |
| 15 | 8352 | 8346 | 83 |  |  |  |  |  |  | 14 |  | 2215 | 258 |  |  |  |  | 2473 |  | 256 | 15 |
| 16 | 82 | 8236 | 8229 | 8222 | 8215 | 8208 | 8201 |  | 8187 | $15 \cdot 8180$ | $2 \cdot 3650$ | 3696 | 3742 | 3788 | 3834 | 3880 | 3926 | 3972 | 4018 | 406 | 16 |
| 17 | 813 |  | 811 | 81 | 81 | 80 | 80 |  | 807 |  |  |  | 522 | 52 | 53 | 53 |  | 5470 |  |  | 17 |
| 18 | 8023 | 8015 | 8 | 8000 | 7992 | 79 |  |  | 7960 | 17.79 | 2.6606 | 6657 | 670 | 67 | 6813 | 6865 | 6916 | 696 | 7020 | 7072 | 18 |
| 19 | 791 |  |  |  |  | 7872 |  | 7855 | 7847 | 18. |  | 813 | 81 | 824 | 83 | 835 | 8412 | 846 | 852 | 857 | 19 |
| 20 | 7803 | 7795 | 7786 | 7777 | 7769 | 7760 | 7 | 7743 | 34 | 19.7725 | 562 | 9619 | 967 | 9734 | 97 | 885 | 9907 | 996 | ． 02 | 00 | 20 |
| 21 | 7693 | 768 | 767 | 76 | 76 | 7648 | 7639 | 7630 | 7621 | 20.76 |  |  |  | 122 |  |  |  | 1463 | 15 |  | 21 |
| 22 |  |  |  |  | 7546 | 7536 |  |  |  | 21.74 |  | 2581 | 2645 | 2708 | 2771 |  |  | 296 |  |  | 22 |
| 23 | 747 | 74 | 745 | 7444 | 34 | 7424 | 7414 | 7404 | 7394 | 22 | S | 4062 | 412 | 41 | 4261 | 43 | 4393 | 445 | 45 | 459 | 23 |
| 24 | 736 | 7353 | 7343 | 7333 | 7322 | 7312 |  |  |  | 3.7 | 3.5474 | 5543 | 561 | 568 | 5750 | 58 | 58 | 595 | 6027 |  | 24 |
| 25 | 72 |  |  |  |  |  |  | 7178 | 7167 | 24.7156 | 3.6952 | 7024 | 709 | 71 | 7240 | 73 | 7384 | 745 | 7528 |  | 25 |
| 26 | 714 | 7133 |  |  | 7099 | 7088 | 7077 | 7065 | 7054 | 25.7043 | 3.843 | 850 | 8580 | 865 | 8730 | 8804 | 8879 | 8954 | 9029 | 910 | 26 |
| 27 | 703 | 70 | 7011 | 699 | 6988 | 697 | 696 |  |  |  |  | 9986 | －06 |  |  |  |  | 045 | 0530 |  | 27 |
| 28 | 692 |  | 析 | 6888 | 685 |  |  |  | 6827 | 27 | 4.138 | 14 | 15 | 1628 | 1709 | 178 | 1870. | 1950 | 2031 |  | 28 |
| 29 | 681 | 680 | 6790 | 677 | 6765 | 675 | 6739 | 67 | 6714 |  |  | 29 | 30 | 3115 | 3198 | 3282 | 33 | 34 | 35 |  | 29 |
| 30 | 670 | 669 | 667 | 6666 | 6653 | 66 | 27 | 14 | 601 | 29.658 | 4.4343 | 4429 | 451 | 4602 | 4688 | 4774 | 4861 | 494 | 503 | 5119 | 0 |
| 31 | 6595 | 6582 | 6568 | 6555 | 6541 | 6528 | 6514 |  | 6487 |  |  |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 64 |  |  | 6444 | 析 | 641 | 64 |  | 6374 | 31 | 729 | 7391 |  |  |  |  |  | 7943 |  |  | 32 |
| 33 | 637 | 63 | 63 | 333 | 6318 | 6304 | 629 | 62 | 6261 | 32 | －877 | 8872 | 896 | 90 | 91 | 92 | 9347 | 944 | 95 | 963 | 33 |
| 34 | 626 | 62 | 6 | 6221 | 62 | 6192 |  |  | 6148 | 33.613 |  | 035 | 04 | 0549 |  | 07 | 084 | 094 | 1038 | 1135 | 34 |
| 35 | 6ts | 614 | 6125 |  |  |  | 606 |  | 6034 | $34 \cdot 6019$ | $5 \cdot 1733$ | 183 | 193 | 2035 | 2136 | 22 | 233 | 243 | 253 | 263 | 35 |
| 36 | 604 | 6030 | 6015 | 5999 | 5984 | 5968 | 595 | 5937 | 5921 | 35.5905 | 5.321 | 3315 | 3419 | 352 | 3626 | 3729 | 3833 | 3936 | 4040 | 414 | 36 |
| 37 | 593 | 5920 |  | 5888 | 5872 |  |  |  |  |  |  |  | 490 |  |  |  |  | 54 |  |  | 37 |
|  | 582 |  | 5793 | 587 | 5760 | 576 |  |  | 5694 | 37.56 |  | 627 | 638 | 64 |  | 6 | 682 | 69 |  |  | 38 |
| 39 | 571 | 5699 | 5683 | 666 | 5649 | 563 | 5615 | 5598 |  | 38.55 | 5.76 | 775 | 787 | 798 | 80 | 8207 | 831 | 843 | 854 | 865 | 39 |
| 40 | 5606 | 5589 | 55 | 5555 | 5537 | 5520 | 5503 | 5485 | 5468 | 39.5450 | 5.9124 | 9239 | 9354 | 9469 | 9584 | 9699 | 9814 | 9929 | 1044 | 15 | 40 |
| 41 | 5497 | 5479 | 5461 | 5443 | 5426 |  |  |  |  |  | 6.0602 | 0720 | 8338 | 0956 |  |  |  |  |  |  | 41 |
|  | 538 | 536 | 5350 | 5332 |  |  |  |  |  | 41 |  | 22 | 23 | 24 |  |  |  | 292 | 304 |  | 42 |
| 43 | 527 | 52 | 5240 | 5221 | 5203 | 51 | 5165 | 514 | 5128 | 42.51 |  | 3682 |  |  |  | 41 | 43 | 442 | 45 |  | 43 |
| 44 | 516 |  | 29 | 5110 | 5091 |  |  | 5034 | 50 | $43^{\prime} 49$ | 6.5036 | 51 | 528 |  | 55 | 56 | 5796 | 592 |  | 677 | 44 |
| 45 | 505 |  | 18 |  | 4979 |  |  |  |  | 44.488 | 6.6514 |  |  |  |  | 71 | 7291 | 7420 |  |  | 45 |
| 46 | 494 | 492 | 4908 |  | 4868 | 4848 |  |  |  |  |  | 8125 | 8257 |  |  | 8654 |  | 8919 |  |  | 46 |
| 47 | 483 | 48 | 4797 | 4777 | 4756 | 473 |  |  | 4675 | $46 \cdot 46$ | 6.947 | 9606 | 974 |  |  |  | 0282 | 041 | 55 |  | 47 |
| 48 | 472 | 47 | 4686 | 4666 | 46 | 46 | 4603 | 458 | 4561 | $47 \times 4$ | 7.094 | 10 | 122 | 136 |  |  | 17 | 1915 | 205 | 219 | 48 |
| 49 | 46 | 45 | 4576 | 4554 | 45 | 45 |  |  | 4448 | 48.44 | 7.24 |  | 270 | 284 |  | 31 | 32 | 341 | 255 |  | 49 |
| 50 | 45 | 4486 | 4465 | 4443 | 4422 | 4400 | 4378 | 4356 | 4335 | 49＇4313 | 7.3905 | 4049 | 419 | 4336 | 4480 | 46 | 476 | 49 | 505 | 519 | 50 |
|  | 4398 | 4376 | 4354 | 4332 | 4310 | 4288 | 4266 |  | 4221 |  |  |  |  |  |  |  |  |  |  |  | 51 |
| 5 | 428 | 42 | 4243 | 4221 | 419 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 52 |
| 53 | 417 | 41 | 4133 | 4110 | 4087 | 40 |  |  | 3995 | 52．397 | $7 \cdot 833$ | 8491 | 8644 | 8796 |  |  | 9254 | 9406 | 955 |  | 53 |
| 54 | 406 | 40 | 4022 | 3999 | 3975 | 395 | 3928 | 39 | 388 | 53 | 7.9817 | 99 | 11 | 028 |  | 05 | 0749 | 090 | 106 | 12 | 54 |
| 55 | 395 |  |  |  |  |  |  |  |  | 54．37 | 8.1295 | 1453 | 1612 | 1770 | 192 | 2086 | 2244 | 240 | 256 | 27 | 55 |
| 56 | 384 |  |  |  | 3752 |  |  |  |  |  | 8.2773 | 2934 | 3095 | 3257 | 3418 | 3579 |  |  | 406 |  | 56 |
|  |  |  | 3690 | 3665 |  |  |  |  | 3541 | 56.35 | 8.4251 | 4415 | 45 | 4743 |  | 5071 | 5235 | 539 | 556 |  | 57 |
| 58 | 362 | 36 | 3579 | 3554 | 352 |  |  |  | 342 | 57 |  |  | 60 | 62 |  |  |  |  |  |  | 58 |
| 59 | 351 |  |  |  | 3417 |  |  | 3341 | 3315 | 58.32 | 72 |  | 75 |  |  | 05 | 822 | 8396 | 8565 |  | 59 |
| 60 | 34 | 3384 | 3358 | 3332 | 3306 | 328 | 325 | 322 | 3202 | 31 | 8.8686 | 885 | 903 | 22 | 9376 | 9549 | 972 | 989 | ＋06 | 023 | 60 |
| 61 | 3300 |  |  | 3221 |  |  |  |  | 3088 |  |  | 研 | 051 |  |  |  | 12 |  |  |  |  |
| 62 | 319 | 31 | 31 | 3110 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 62 |
|  |  |  |  |  |  |  |  |  |  | 62 28 |  | 330 |  |  |  |  |  | 43 |  |  | 63 |
| 64 | 2970 | 2943 | 2915 | 2887 | 286 |  |  |  | 27 | 63.27 |  | 478 |  |  |  |  |  |  |  | 625 | 64 |
| 65 | 286 | 2832 | 2804 | 27 |  |  |  |  |  | 26 |  |  |  |  |  |  |  |  |  |  | 65 |
| 66 | 275 |  | 2694 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
| 67 | 26 |  |  | 2554 |  |  |  |  |  | 66 | 9.9032 | 922 |  |  |  |  |  | 038 |  |  |  |
| 68 | 253 |  | 2472 | 2443 | 2413 |  |  |  | 2295 | $67 \cdot 22$ | 10.05 |  |  |  |  |  | 1684 | 1881 |  |  | 68 |
| 69 |  |  |  |  |  |  |  |  |  |  |  | d86 | 析 |  |  |  |  | 3878 |  |  | 69 |
| 70 | 23 | 2281 | 2251 | 221 | 2190 | 2160 | 212 | 2099 | 2060 | 69．203 | 10．346 | 366 | 38 | 407 | 427 | 447 | 467 | 487 | 5077 | 527 | 70 |
| 71 | 22 | 2171 | 2140 | 2109 | 20 | 20 | 20 | 1986 | 1955 | 70 | $10 \cdot 494$ | 51 |  | 55 |  |  | 617 | 637 |  |  | 71 |
| 72 | 201 |  |  | 1998 |  | 19 |  |  | 1842 |  |  | 683 |  |  |  |  |  | 矿 |  |  | 72 |
| 7 | 19 |  |  |  |  |  |  | 1760 | 1729 | 72. |  | 819 | 832 | 853 | 87 | 895 | 916 | 937 | 958 | 979 | 73 |
| 74 | 187 | 1840 | 1808 | 17 | 1744 | 171 | 1680 | 647 | 1615 | $73 \cdot 15$ | 10.937 | 9592 | 980 | －018 | 023 | 044 | 065 | 086 | 108 | 129 | 74 |
| 75 | 176 |  |  |  |  |  |  | 535 |  |  | $11 \cdot 085$ | 1073 |  |  |  |  |  | 23 |  |  | 75 |
| 76 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 析 |  |  | 76 |
| 77 | 1542 | 1509 | 1476 | 1443 | 1409 | 137 | 1342 | 1309 | 1275 | 76.12 | 11.381 | 403 | 4256 | 44 | 469 | 492 | 5142 | 536 |  | 537 | 77 |
| 78 | 1432 | 1399 | 7365 | 1331 | 1298 | 16 | 1230 | 1196 | 1162 | 77 | 11.529 | 551 | 574 | 596 |  | 6413 | 663 | 686 |  |  | 78 |
| 79 | 13 |  | 1254 | 1220 | 1 | ， | 1118 | 1083 | 1049 | 78．1014 | 11.6769 | 6997 | 7224 | 745 | 7678 | 7906 | 8133 | 836 | 858 | 88 | 79 |
| 80 | 1213 | 1178 | 1144 | 109 | 1075 | 1040 | 1005 | 097 | 0935 | 79.090 | 11.8248 | 847 | 8708 | 8938 | 916 | 939 | 962 | 985 | ＋08 | 03 | 80 |
| 81 |  |  | 1033 | 0998 | 0963 | 0928 | 0893 | 57 | 22 | ．078 | 11.972 | 9959 | －192 | （19 | 0658 |  | 1 | 1357 |  |  | 81 |
| 82 | 厓 |  |  | 0887 | 0851 | ， |  | \％ 44 | 崖 | 81＇067 |  | 44 |  | 仡 | 1437 | 238 | 219 | 2855 |  |  | 82 |
| 83 | 0883 | 084 | 0812 | 0776 | 0740 | 0704 | 066 | 0632 | 0595 | 82.055 | 12.26 | 2921 | 315 | 3398 | 3637 | 387 | 4114 | 4353 | 459 | 48 | 83 |
|  | 0773 | 87 | ， |  | 㖪 |  | 5 55 | 519 | 0482 | 83 |  | 4402 | 4643 | 488 | 512 | 536 | 5610 | 585 | 6093 |  | 84 |
| 85 | 0664 |  |  | 055 |  |  |  |  |  |  |  |  |  |  |  | 688 | 7105 | 731 |  |  | 85 |
| 86 | 0554 | 0517 | 0480 | 0442 | 0405 | 0368 | 331 | 293 | 256 |  | 12 | 7364 | \％ | 7858 | 8106 | 8353 | 8600 | 884 | 9095 | 3 | 86 |
| 87 | 0444 | 0406 | 0369 | 033 | 029 | 025 | 0218 | 0180 | 014 | $86 \cdot 010$ | 12.859 | 88 | 90 | 93 | 95 | 9845 | ＋09 | 034 | 059 |  | 87 |
| 88 | 033 | 026 | O25 | 22 |  | － 14 | ， | 068 | （1） | 36.99 | $13 \cdot 0072$ |  | 2 | 咗 |  | 1338 | 1591 | 1842 |  | 235 | 88 |
| 89 | 022 | 0186 | 014 | 010 | 0070 | －032 | 9993 | 9954 | 9916 | 87.987 | $13 \cdot 1550$ | 180 | 206 | 2318 | 2574 | 2830 | 3086 | 334 | 359 | 385 | 89 |
| 90 | 0114 | 0076 |  | 998 | 9959 | 9920 | 81 | 842 | 9802 | 88.9763 | 13．3028 | 328 | 35 | 380 | 4064 | 4323 | 458 | 484 | 51 | 53 | 90 |
|  | P00 | 575 | 926 | 878 |  |  |  |  |  |  |  |  |  | 577 |  |  | 6077 | 833 |  |  |  |
| 92 | 989 | 9855 | 9815 | 9776 | 9736 | 968 | 55 | 961 | 9576 | $90 \cdot 953$ | 13.598 | 6249 | 65 | 6779 | 7043 | 730 | 757 | 783 | 810 | 836 | 92 |
|  | 9785 | 9745 | 9705 | 9664 | 9624 | 84 | 9543 | 9503 | 9462 | 91.942 | 13.746 | 7730 | 799 | 8265 | 8533 | 8800 | 9068 | 933 | 960 | 987 | 93 |
|  | 9675 | 9634 | 9594 | 9553 | 9 513 | 9472 | 431 | 9390 | 9349 | 2930 | 13894 | 921 | 94 | 975 | －022 | 0293 | 05 | 0834 | 1104 | 137 | 94 |
| 95 | 956 | 9524 | 9483 | 9442 | 9401 | 9360 | 9319 | 277 | 9236 | 93.9194 | 14.0419 | 069 |  | 123 | 1512 | 178 | 205 | 233 |  |  | 95 |
| 96 | 9455 | 9414 | 9373 | 19331 |  | 9248 | 9206 | 164 | 9122 | 94.908 | 14．1897 | 2173 | 2449 | 2726 | 3002 | 13278 | 3554 | 3830 | 410 |  | 96 |
|  | 9345 | 930 | 926 | 92 | 90 | 9136 | 9094 | 9051 | 9009 | 95.896 | 14．3375 | 3654 | 3933 | 4212 | 4491 | 4770 | 5049 | 532 | 560 |  | 97 |
|  | 923 | 9193 | 915 | 910 | 90 | 9024 | 8981 | 8939 | 889 | 96．885 | 14.4853 | 5135 | 5417 | 569 | 5981 | 6263 | 6545 | 6827 | 710 | 7390 | 98 |
|  | 9126 | 9083 | 9040 | 898 | 8955 | 8912 | 8869 | 8826 | 8783 | 97.873 | 14.6331 | 6616 | 690 | 7186 | 7470 | 775 | 8040 | 832 | 860 | 889 | 99 |
| 100 | 9016 | 8973 | 8930 | 8887 | 8843 | 8800 | 8756 | 8713 | 8669 | 98.862 | 14．7809 | 8097 | 8385 | 8672 | 8960 | 9248 | 9535 | 9823 | III | 0398 | 100 |
|  | $30^{\prime}$ | 29 | 28 | 27 | $26^{\prime}$ | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ | $22^{\prime}$ | 21 | 30＇ | $29^{\prime}$ |  | 27 | 26 | 25 | 24 | 23 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Cos |  |  |  |  |  |  |

TRAVERSE TABLES．

| 8 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $8^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $41^{\prime}$ | 42＇ | 43 | 44＇ |  | 46 | 47 |  | $9^{\prime}$ |  | $41^{\prime}$ | 42 | 43 | 44 | ｜ $45^{\prime}$ |  |  |  |  |  |
|  | 9886 | 9885 | 988 | 9884 | 9884 | 9884 | 9883 | 98 | 98 | ．9882 | 1507 | 1510 | 1513 | 1515 | 518 | 1521 | 1524 | 1527 | 1530 |  |  |
|  | 9772 | 9771 | 977 | 9769 |  | 9767 | 9766 | 9765 | 97 |  | 3014 | 3019 |  | 3031 | 3037 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 9429 | 9427 |  |  |  |  |  |  |  |  | 硣 |  |  | 7577 | 7592 | 706 |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 08 | 9083 |  |  |  |  |  |  | 90 |  |  | 2078 |  | 2124 | 2147 | 2170 | ， | 16 | 2239 |  |  |
|  |  | 8968 |  |  |  |  |  | 8945 | 894 | 8．893 |  | 35 | 3613 | 3639 | 366 | 3691 | 17 | 43 | 3769 |  |  |
| 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 | 8744 | 8739 | ${ }^{8734}$ | 87 | 8725 | 8720 | 87 | 8710 | 8705 | 10.87 | 1.6575 | 6607 | ${ }^{6639}$ | － | ， |  | 65 | 析 | 6828 |  | 1 |
| 12 | 8630 | 8625 | 8619 | 86 | ${ }^{\text {d }}$ | 8603 | 8598 | 8593 | 858 | 11.858 | $1 \cdot 808$ | 8117 | 8151 | 8186 | 8220 | 555 | 89 | 324 | 8358 |  | 2 |
|  | 8516 | 8510 | 850 | 8498 | 849 | 8487 | 8481 | 8475 | 8470 | 12.84 | 1.958 | 9627 | 9664 | 9701 | 9739 | 9776 | 9813 | 9851 |  |  | 3 |
|  |  |  |  |  |  |  |  | 8358 | 8352 |  |  | 113 | 11 | 12 | 1257 |  | 1338 | 1378 | 1418 | 14 |  |
| 15 | 8287 | 828 | 8274 |  |  |  |  |  |  |  |  | 26 | 268 | 2732 | 2775 | 2819 | 2862 | 2905 |  |  | 15 |
| 16 | 8173 | 8166 | 8159 | 8152 | 8145 | 8138 |  |  |  | 15.81 | 24110 |  |  |  |  |  |  |  |  |  | 16 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7330 | 7382 |  |  |  |  | 18 |
| 19 |  |  |  |  |  |  |  |  | 776 |  |  | 868 | 8740 | 8794 |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  |  | 保 |  | 0252 |  |  |  |  | 0 | 597 |  | 20 |
| 21 | 7602 | 75 |  |  |  | 7556 | 7547 |  | 7528 | 20 | 3.1644 | 1704 | 1765 | 1825 | \％ | 46 | 06 | 2067 | 2127 |  | 21 |
| 22 | 7488 | 7478 | 7469 | 7459 | 74 | 7440 | 74 | 7420 | 7410 | 21.74 | 3.3151 | 32 | 3277 | 3341 | 3404 | 3467 | 3530 | 3594 |  |  | 22 |
| 23 |  | 736 | 7354 | 73 | 73 |  | 7313 |  |  | 22.72 |  | 472 | 479 | 4856 | 4922 | 4988 | 5055 | 5121 |  |  | 23 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
| 25 | 71 | 71 | 71 | 71 |  |  | 7079 |  | 705 | 24.70 | 3.767 | 774 | 7815 | 7887 | 7959 | 803 | 8103 |  |  |  | 25 |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{gathered} 28 \\ 70 \end{gathered}$ | 66 | ${ }^{6797}$ | $6778$ |  |  | $\begin{gathered} 6741 \\ 8 \times 60 \end{gathered}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 28 <br> 29 |
| 29 30 | 6689 6575 | ${ }_{6}^{667}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 30 |
| 31 | 646 | 6447 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 |
|  |  | 6332 | 631 | 63 |  |  |  |  |  |  |  | 831 |  | 8495 | 7 | 8679 | 8771 | 863 |  |  |  |
| 33 | 62 | 621 | 620 | 618 | 61 | 61 |  |  | 6 | 32 |  |  |  | － |  | 220 |  |  |  |  | 33 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 34 |
| 35 |  |  |  |  |  |  |  |  |  |  | 5.27 | 284 | 2941 | 3042 | 3143 | 3243 |  | 344 |  |  | 35 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 36 |
|  | 57 | 554 | 5743 |  |  |  |  |  | ${ }_{552}^{564}$ | 36．5 |  |  |  |  |  |  |  |  |  |  | 38 |
|  |  |  |  |  |  |  | 544 |  |  |  |  |  |  |  |  | 9328 |  | 9552 |  |  | 39 |
| 40 | 54 | 54 | 53 | 5380 | 5362 | 5345 | 532 |  | 529 | 39.527 | $6 \cdot 0274$ |  |  |  |  |  |  | 1079 |  |  | 40 |
| 41 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 508 | 507 | 50 | 50 | 50 |  |  |  | 49 |  |  |  |  |  | 528 | S |  |  |  |  |  |
| 44 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 45 |
| 46 | 474 | 4727 | 4707 | 4687 | 4667 | 4646 | 46 | 460 | 458 |  | 6.9315 |  |  |  |  |  |  | 02 |  |  | 46 |
|  |  | 4613 |  | 457 | 4551 |  |  |  |  |  |  |  |  |  |  | 149 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 49 50 | 44 | 43 | 4 |  |  |  |  |  | 423 |  |  |  |  |  |  |  |  |  |  |  |  |
| 51 | 417 | 4154 | 4132 | 4109 | 4087 | 4064 | 404 | 401 | 398 | $50 \cdot 397$ |  |  |  |  |  |  |  |  |  |  | 51 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $53$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 54 |  | 38 | 37 |  |  |  |  |  |  |  |  |  |  | 1836 |  |  |  | 24s |  |  |  |
| 55 |  | 368 | 36 |  |  |  |  |  |  | 54.35 | 8.2877 |  | 3193 |  | 3510 |  |  | ， |  |  |  |
| 5 | 360 | 3581 | 35 | 353 | 35 |  |  |  |  |  |  | 45 | 4706 | 148 |  | 51 |  | 15511 |  |  | 56 |
| 57 | 349 | 346 | 344 | 3416 | 33 |  |  |  |  |  |  |  | 62 |  |  | 6710 |  | 38 |  |  |  |
| 58 |  |  |  |  |  |  | 322 |  | 317 | 57.31 | 8.7398 |  |  |  | 8065 | ${ }_{8}^{8232}$ | 83 | 85 |  |  | 58 |
|  |  |  |  |  |  |  |  | 3081 2964 |  | 58．3028 |  |  |  | 9414 |  |  |  | ＊092 |  |  | 59 |
| 60 | 3149 | 3123 | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 60 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 280 | 27 | 27 |  |  |  |  |  |  |  |  |  |  |  |  | 5838 | 6019 | 627 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7727 |  |  | 54 |
| 65 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0591 | 07 |  |  |  |
|  | 235 |  |  |  |  |  | 217 |  | 21 |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 22 | 22 | 21 | 21 |  |  | 1935 | 2026 | 19 | $6 \cdot 1$ | 10.24 | 26 | 2857 | 3053 | 3248 | 3445 |  | 3835 |  |  |  |
| 69 |  |  |  |  |  |  |  |  | 18 | 68 | $10 \cdot 39$ | 417 | 4370 |  | 4767 | 4965 |  |  |  |  |  |
| 70 |  |  |  |  |  |  |  | 1791 | 1760 |  |  |  |  |  |  |  |  |  |  |  |  |
| 71 | 1893 | 186 | 183 | 179 |  |  |  | 167 | 1642 | $70 \cdot 16$ | 10.6 |  | 7395 | 759 |  | 8008 |  | 84 |  |  |  |
| 72 | 177 | 17 | 17 | 15 | 1652 |  |  | 15 | 15 |  | 10.8 | 870 |  | 91 | 9322 | 9529 | 9736 | 9943 |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 74 | 155 |  | 1485 |  |  |  |  | 13 | 119 |  |  |  |  |  |  |  |  |  |  |  |  |
| 75 | 143 |  | 1370 | 133 | 1304 |  | 123 | 12 | 117 | 74 | 11.3014 |  | 34 |  | 387 | 4093 |  | 4524 |  |  |  |
|  | 132 |  |  |  |  |  |  |  |  |  |  |  | 49 |  |  |  |  | 605 |  |  |  |
|  | 120 | 117 | 11. | 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 78 | 1094 | 10 |  |  |  |  |  |  |  |  | 1175 |  |  |  | 8432 |  |  | 910 |  |  | 80 |
| 79 80 80 | 0865 | 08 |  |  |  |  | 065 |  |  | 79.054 | 11. | 0779 | 1009 | 1239 | 1469 | 169 | 1929 |  |  |  | 90 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 |  | 060 | 0565 |  | 0493 | 045 | 04 | 038 | ${ }^{\text {a }}$ | 8 | 12 | 379 | 40 | 427 | 45 | 47 | 49 | 521 | 5448 |  |  |
| 8 | 05 | 04 |  | 04 |  |  | 03 | 02 |  | 82 |  | 5308 |  | 5785 | 602 | 626 | 65 | 674 |  |  |  |
| 84 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 | 0294 | 0257 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 01 |  |  |  |  |  |  |  |  |  |  |  |  |  | 057 | 0826 | 2 | 1321 |  |  |  |
| 87 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 236 | 25 | 2848 |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 89 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5390 | 5646 7170 | 7429 |  |  |  |
|  |  |  |  |  |  |  |  | 93 | 92 | 89 |  |  |  |  | 817 | 843 | 869 | 89 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 93 | 9340 |  |  |  | 9176 |  |  | 9052 |  | 14.0138 |  | 067 |  | 1207 | 1475 |  |  |  |  |  |
|  | 9267 |  | 9184 |  |  |  |  |  |  |  | 14 | 19 | 21 | 245 | 2726 | 299 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 342 |  | 3971 | 42 | 45 | 479 |  |  |  |  |
|  | 9038 | 8996 |  |  |  |  |  |  | 8699 |  | 14.465 | 4934 | 5210 | 5486 | 5762 | 6038 | 6314 |  |  |  |  |
|  |  |  |  |  |  |  | ${ }^{8668}$ | ${ }_{8}^{8625}$ | 8582 | 95．8538 | 14 | 64 |  |  | 7281 | 7560 | 8839 | 8117 |  |  |  |
|  |  |  |  |  |  |  | 85 | ${ }^{8507}$ | 8464 | 96＊8420 | 14.7 |  |  | 8517 | 8799 | 908 | 9363 |  |  |  |  |
|  |  | 8538 | 8494 | 3450 | 406 | 362 | 8317 | 3273 | 3228 | $98 \cdot 8184$ | 0686 | 0973 | 26 | 548 | 1836 | 123 | 2411 | 2698 | 2986 |  |  |
|  | 20＇ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ | $13^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ |  | $19^{\prime}$ |  | $17^{\prime}$ | $16^{\prime}$ | 15 | $14^{\prime}$ | $13^{\prime}$ |  | 11 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $8^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $8^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 51 | 52 | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | $58^{\prime}$ | 59 | $50^{\prime}$ | $51^{\prime}$ | 52 | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | $58^{\prime}$ | 59 |  |
|  | 9881 | 9881 | 9880 | 9880 | 9880 | 9879 | 9879 | 9878 | 9878 | 987 | 1536 | 1538 | 1541 | 1544 | 1547 | 1550 | 1553 | 1556 | 1559 | 1561 |  |
|  | 97 | 9762 |  | 9760 | 9759 | 9758 | 9757 | 9756 | 9756 | 1975 | 307 | 3077 | 3083 | 3088 | 30 | 180 | 3106 | 31 | 317 | 123 |  |
|  | 96 | 9643 |  | 9640 |  |  | 9636 | 9635 | 9633 | 2．963 | 4607 | 4615 | 462 | 46 | 4641 | 4650 | 4659 | 4667 | 4676 | 84 |  |
|  |  |  |  |  |  |  |  |  | 9511 |  | 142 | 6154 | 6165 | 617 | 6188 | 6200 | 621 | 622 | 6234 | 24 |  |
| 5 | 9407 | 9405 | 940 | 00 | 9398 | 9396 | 9393 | 9391 | 9389 | 4.9387 | 78 | 769 | 7707 | 7721 | 7736 | 775 | 776 | 7779 | 7793 | 80 |  |
| 6 | 9288 | 928 | 92 | 9280 | 9278 | 9275 | 9272 | 9269 | 9267 | $5 \cdot 9264$ |  | 9231 | 9248 | 92 | 9283 | 9300 | 93 | 9334 | 9352 | 36 |  |
|  | 析 | 918 | 91 |  |  | 9154 | 915 |  |  |  |  | 076 |  |  |  | 0850 | 0870 |  |  | 0930 |  |
|  | 90 |  |  |  |  |  |  |  | 9022 | $7 \cdot 901$ | －2285 | 2308 | 233 | 2354 | 2377 | 2400 | 2423 | 2446 | 2469 | 2492 |  |
|  | 8933 |  |  |  |  |  |  |  |  |  |  |  | 38 | 38 |  | 3950 | 3976 | 2002 | 4027 | 05 |  |
| 10 | 88 |  |  |  |  | 879 |  |  |  | 87 |  |  |  |  |  | 5500 | 5529 | 555 | 5586 | 61 |  |
| 11 | 8695 | 8690 |  |  |  |  |  |  | 8656 | 10.86 |  | 923 | 6955 | 6987 | 701 | 050 | 081 | 7113 | 7145 |  |  |
| 12 | 857 | 85 | 8566 |  | 8555 | 8550 | 8544 | 8539 | 8534 |  |  | 846 | 84 | 8531 | 8565 | 8600 | 8634 | 8669 | 8703 | 8738 |  |
| 13 | 845 | 845 | 84 | 8441 |  | 8429 |  |  |  | 12.840 | 1.9963 | ＋000 | 00 |  |  | 0150 | 0187 | 0224 | 62 | 0299 |  |
| 14 | 833 |  |  |  |  |  |  |  |  |  | 8 | 1539 | 157 | 1619 |  | 70 | 18 | 1780 | 1820 | 186 |  |
| 15 | 8221 | 8214 | 8207 | 8201 | 8194 | 8187 | 8180 | 8174 | 8167 | 14 | 3034 | 3077 | 3120 | 3163 | 32 | 325 | 329 | 333 | 337 | 342 | 15 |
| 16 | 81 | 809 | 8088 | 8081 | 8074 | 80 | 8059 | 8052 | 8045 |  | 2.4570 | 4616 | 4662 | 4708 | 475 | 48 | 4846 | 48 | 4938 | 4984 | 6 |
|  | 798 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 6350 | 6398 |  |  |  |  |
| 18 | 786 | 78 | 7849 | 7841 | 7833 | 7825 | 7817 | 7808 | 7800 | 17 | $2 \cdot 7641$ | 7693 | 7744 | 77 |  | 7900 | 79 | 8003 |  | 810 |  |
| 19 | 7746 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9450 | 505 |  | 9613 |  |  |
| 20 | 7628 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 12 |  |
| 21 | 75 | 7500 |  |  |  |  |  |  |  | 20.742 | ． 2248 |  |  |  | 2489 | 2550 | 261 | 2670 |  |  |  |
| 22 | 739 | 73 |  |  |  | 734 | 733 |  | 7311 |  |  |  |  |  |  | 41 | 416 | 42 | 4289 |  |  |
| 23 | 7272 |  |  |  |  | 7220 |  |  | 7189 | 22 | 3.5319 | 538 |  |  | 5583 | 56 | 571 |  |  |  |  |
| 24 | 715 | 7143 |  |  |  | 7100 | 7089 |  | 7067 |  | 3.6855 | 692 | 69 | 7062 | 7130 | 719 | 726 | 73 | 7406 | 4475 |  |
| 25 | 703 | 7024 | 7012 |  |  | 6979 | 6967 | 6956 | 6945 | 24．6933 | 83 | 846 | 85 | 8606 | 8678 | 87 | 882 | 889 | 396 | 03 |  |
| 26 | 69 | 6905 | 68 | 6881 | 6870 | 6858 | 6846 | 6834 | 6823 |  | 3.9926 |  | 0075 | 0150 | 0225 | 0299 | 0374 | 0449 | 0524 | 059 | 26 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | 667 | 66 | 6654 | 6641 | 6629 | 66 | 6604 | 6591 | 6578 | $27 \cdot 65$ | 42997 | 30 | 31 | 3238 | 33 | 339 | 34 | 356 |  |  |  |
| 29 | 65 | 6547 |  |  |  |  |  |  |  |  | 44533 | 46 |  |  | 4866 | 494 |  |  |  |  |  |
| 30 | 644 |  |  |  | 6388 | 637 |  |  |  |  |  |  |  |  | 6413 |  |  |  | 6758 |  |  |
| 31 | 632 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 62 | 619 | 617 |  |  |  |  |  |  |  |  |  |  |  |  | 9599 |  | 3 | 9875 |  |  |
| 33 | 60 |  |  |  |  | 6012 |  |  |  | $32 \cdot 59$ | 0675 |  |  |  | 1054 | 1149 | 1244 |  |  |  |  |
| 34 | 596 | 595 |  |  |  | 589 | 5876 |  |  |  | 5.22 | 230 | 24 | 25 | 260 | 26 | 27 | 28 | 293 |  |  |
| 35 | 58 | 58 | 5817 | 5802 | 5786 | 577 | 575 | 5739 | 5723 | 34.57 | 5.37 |  |  | 40 | 4149 | 42 | 435 | 44 | 455 | 465 |  |
| 36 | 5730 | 5714 | 5698 | 5682 | 5666 | 5649 | 5633 | 5617 | 5601 | 35．558 | $5 \cdot 5282$ | 538 | 5489 | 5592 | 5696 | 5799 | 5903 | 6006 | 6110 | 6213 |  |
|  | 56 |  |  |  |  |  |  |  |  |  | 寿 |  |  |  | 7243 |  |  |  |  |  |  |
| 38 | 549 | 547 |  |  | 5425 | 5408 |  | 537 | 53 | 37 | 5.83 | 846 | 85 |  | 8790 | 88 | 9008 | 9118 |  |  |  |
| 39 | 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 04 |  |  |  |  |  |
| 40 | 525 | 5238 | 5220 | 5202 | 5184 | 516 |  | 5130 | 5112 | 99 | $6 \cdot 1424$ | 153 | 16 | 1769 | 1884 | 99 | 2114 | 2229 | 2344 | 245 |  |
| 41 | 513 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 501 | 50 | 498 |  | 49 |  |  |  | 4867 |  |  | 46 |  |  | 497 |  | 52 |  |  |  |  |
| 43 | 490 |  |  |  | 48 | 480 | 478 | 4765 | 47 | 4 |  | 615 |  |  | 65 |  |  |  |  |  |  |
| 44 | 4781 | 476 | 474 | 22 | 2 | 468 | 466 | 4643 | 623 | 43.4 | 75 | 76 | 782 | 79 | 8073 | 819 | 8325 | 8452 | 857 |  |  |
| 45 | 4663 | 46 | 462 | 4602 | 4582 | 4562 | 4541 |  | 501 | 44. | 6.910 | 923 |  | 9490 | 9620 | 972 | 987 | ＋008 | 013 | 226 |  |
| 46 | 45 | 4523 | 45 | 4482 |  |  |  |  |  | 45.435 |  |  |  |  | 1167 |  |  |  |  |  |  |
|  | 44 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2849 |  |  |  |  |  |
| 48 | 430 | 42 | 42 | 4242 | 42 |  | 4177 |  | 4134 |  |  |  |  |  |  | 43 | 45 | 467 |  |  |  |
| 49 | 41 |  |  |  | 4100 | 407 |  |  | 4012 |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | 4070 | 4047 | 4025 | 4002 | 3980 | 3957 | 3935 | 3912 | 3390 | 49.386 | $7 \cdot 6780$ |  |  | 7212 | 7355 |  | 7643 | 7786 | 7930 | 807 |  |
| 51 | 395 | 392 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 38 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 3523 | 52.34 |  |  |  |  |  | 21 |  |  |  |  |  |
| 54 | 359 | 35 |  |  |  |  |  |  | 3401 | 53.33 | 181 | 30 |  |  | 3544 | 36 | 38 |  | 416 | 431 |  |
| 55 | 347 | 34 |  |  |  |  |  |  |  | 54.32 | － |  | 477 |  |  |  |  |  | 5723 |  |  |
| 56 | 335 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 32 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 31 | 30 | 3069 |  |  |  |  |  | 291 |  |  |  |  |  |  | 9899 | ＋0 |  |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 16 |  |  |  |  |
| 60 | 2884 | 2857 | 2830 |  | 2776 | 27 | 2722 | 269 | 266 | 59.264 | 9.2136 |  |  |  | 2826 |  | 3171 | 3344 | 3516 | 368 |  |
| 61 | 27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 26 | 26 |  |  |  |  |  |  |  | 61 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 64 | 2409 | 238 | 2352 |  | 2294 |  | 223 |  | 217 | 63.2 | 9.827 |  |  |  |  | 91 | 93 | 956 | 9130 |  |  |
| 65 | 229 |  | 223 |  |  |  |  |  |  | 202 | 9981 |  |  |  |  |  |  |  | 1309 |  |  |
| 66 | 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 193 | 19 | 187 | 1843 | 1813 | 178 | 175 | 172 | 1690 | $67 \cdot 16$ | $10^{\circ} 4$ |  |  |  | 520 | 53 |  |  |  | 618 |  |
| 69 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 70 | 169 | 1666 | 1635 | 1603 | 1572 | 1540 | 1509 | 147 | 1445 | 69 | 10.74 | 769 | 789 | 809 | 829 | 849 | 870 | 890 | 9102 | ， |  |
| 71 | 157 |  |  |  |  |  |  |  | 1323 | 70\％12 | 10.902 |  | 9436 | 96 | 984 |  |  | 0456 |  |  |  |
| 72 | 14 |  |  |  |  |  | 126 | 123 | 1201 | 711 | ， |  |  |  | 139 |  |  |  |  |  |  |
| 73 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 74 | 1223 | 11 | 11 | 1124 | 1090 | 105 |  | 0990 | 095 | 73.09 | 11.36 | 38 | 40 | 4273 | 4486 | 469 | 49 | 5124 | 53 | 55 |  |
| 75 | 110 | 107 |  |  |  |  |  |  |  |  |  | 58 |  | 5817 | 03 |  | 6464 | 6679 |  | 711 |  |
| 76 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 77 | 08 | 0833 | 07 | 0764 |  | 0654 | 0660 | 0625 | 059 | 76.05 | 11.82 | － | 86 |  | 967 |  |  |  | ＋01 |  |  |
| 78 | 07 | 0714 |  | 0644 | 0609 | 0574 | 0538 | 0503 | 046 | 77.04 | 11.977 |  | 02 | 045 | 067 | 08 | 112 | 13 | 157 | 1 |  |
| 79 |  |  |  |  |  |  |  |  | 迷 | 78.031 | 313 | 54 |  |  | 221 | 2488 |  |  | 12 |  |  |
| 80 | 0511 | 0476 | 0440 | 404 | 0368 | 033 | 0296 | 026 | 0223 | 79.01 | 12.2849 | 307 | 330 | 353 | 376 | 399 | 422 | 445 | 120 | 491 |  |
| 81 | 039 | 03 | 0320 |  | 0248 | 0211 | 0174 | 0138 | 0101 | 80 |  | 46 | 48 | 50 | 531 | 55 | 578 | 60 |  |  |  |
|  |  |  |  |  | 0127 |  |  |  |  |  | 12 | 615 | 639 | 6627 | 686 | 70 | 7334 | ， |  | 8041 |  |
| 8 | 015 | ， | 0081 | 0044 | ＋007 | 9969 | 9932 |  | 973 |  |  |  |  |  | 8410 | 8648 | d | 912 |  | 960 |  |
| 84 | ＋03 | 995 | 99 | 9924 | 9886 | 9848 | 981 | 9773 | 973 | 82.96 | 12.899 | 92 | 947 | 97 | 9957 | ＋198 | 043 | － | 092 | 116 |  |
| 85 | 9918 |  |  |  |  |  |  |  | 9612 |  | 13.0527 |  | 101 | 1260 | 1504 | 1748 | 193 | 2237 | 2481 | 27 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 87 | 96 | 96 |  |  | 9525 | 9486 | 9447 | 9407 | 936 | 85 | 135 | 3848 | 407 |  | 459 | 48 | 56 | 53 | 51575 | 748 |  |
|  | 95 | 9523 |  |  |  |  | 9325 | 928 | 9246 | 86.92 | 13.513 | 53 | 56 | 58 | 614 | 63 | 66 | 69 | 715 | 741 |  |
|  | 9444 | 9404 | 9364 | 9324 |  |  | 9204 | 9164 | 9123 |  |  |  | 18 | 73 | 692 | 析 | 220 | 4， | 8715 |  |  |
| 90 | 9325 | 9285 | 9245 | 9204 | 164 | 123 | 9083 | 9042 | 9001 | $88 \cdot 896$ | $13 \cdot 8205$ | 846 | 872 | 898 | 923 | 949 | 975 | ． 15 | 027 |  |  |
| 91 | 920 | 91 | 9125 |  | 9044 | 9002 | 896 | 8920 | 887 |  | 13.9740 | ＋002 |  | 0525 | 078 | 1048 | 130 | 151 | 183 | 209 |  |
|  | 908 | ， |  |  | 23 |  | 8840 |  | 8757 |  | 14.127 | 154 | 180 | 20 | 233 | 2598 | 286 | 12 |  |  |  |
| 93 | 896 | 892 | 8886 | 8844 | 8803 | 876 | 8719 | 867 | 863. | 92． |  | S617 |  | 515 | 5 | 414 | 44 | 4682 | 450 | 677 |  |
| 94 | 885 | 8809 |  |  | 8682 | 8640 | 8598 | 8555 | 851 | 92．847 | 14.4347 | 461 | 48 | 51 | 5428 | 569 | 59 |  | 65 | 677 |  |
| 95 | 8732 |  |  |  |  |  |  |  |  | 34 | $14 \cdot 5883$ | 615 | 6429 | 6702 | 6975 | 7248 | 7521 |  | 8067 | 834 | 5 |
| 96 | 8614 | 857 | 8528 | 8485 |  | 8275 |  | ， |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 97 | 849 | 845 | 84 |  | 832 | 827 | 8234 | 81 | 81 | $95 \cdot 810$ | 14895 | 9233 | 9512 | 979 | －069 | 0348 | 0627 | 090 | 184 | 146 |  |
| 98 | 8376 | 833 |  | 245 | 8201 | 8157 | 8112 | 8068 | 8024 |  | 1s | 077 | 105 | 1335 | 1616 | 1898 | 2179 | 246 | 274 | 302 |  |
|  | 825 | 821 |  | 25 |  |  | 799 | 7946 | 7770 | 97.7856 | 15.2025 | 2310 | 2594 | 2875 | 3163 | 3448 |  | 4017 | 5060 | 4586 | 99 |
| 100 | 8139 | 8095 | 8050 | 8005 | 7960 | 7915 | 7870 | 7825 | 7779 | 98.773 | 15．3561 | 3848 | 4136 | 4423 | 4710 | 4998 | 5285 | 5573 | 5860 | 6147 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | 7 | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2{ }^{\prime}$ | $1^{\prime}$ | 10 | $9^{\prime}$ | $8{ }^{\prime \prime}$ |  | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | 3 | $2^{\prime}$ |  |  |
| 81 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.

| 9 | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $9^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $2^{\prime}$ | 3 | ' | $5^{\text {r }}$ |  |  |  |  |  |  | $2^{\prime}$ | 3 |  |  |  |  |  |  |  |
|  |  | 9876 | 987 | 97 | 973 | 9875 | 9874 | 9874 | 9873 | 19873 | 1564 | 1567 | 570 | 1573 | 1576 | 1579 | 1582 | 84 | 587 |  |  |
|  |  |  | 97 | 97 | 07 |  |  |  |  |  |  | 3134 | 3140 |  | 3152 |  | 3163 | 59 | 3175 | 3180 |  |
|  |  |  | 96 | 9627 | 9625 |  | 9622 | 9621 |  | 2.96 |  | 4702 | 47 | 4719 |  | 4736 | 5 | 5 | 2 |  |  |
|  | 9508 |  | 9504 | 9502 | 9500 | 9498 | 9497 | 9495 | 9493 | 3.948 | 6257 | 6269 | 6280 | 5292 | 6303 | 6315 | 6326 |  |  |  |  |
|  | 938 |  |  |  | 9375 | 937 |  |  |  | 493 |  |  |  |  |  |  |  |  |  |  |  |
|  | 9261 | 9259 | 92 | 92 | 92 | 92 | 9245 | 92 | 923 | 5.923 | . 9388 | 94 | 94 | 9438 | 945 | 9472 | 9489 | 9507 |  | 954 |  |
|  | 913 | 9135 | 91 | 91 |  |  | 9119 | 91 | 911 | $6 \cdot 9$ | 1.09 | 0971 |  |  |  |  |  |  |  |  |  |
|  | 9015 | 90 |  |  |  |  | 893 | 89 | 8986 | 7.89 | 25 | 25 | 256 | 2 |  |  | 26 | 26 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 413 | 415 | 418 | 420 | 423 |  |  |  |  |
| 10 | $\frac{8769}{864}$ |  |  | 8755 |  |  |  |  | 8732 |  | . 5 |  | 5701 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 83 | 839 | 851 | 83 | 83 |  |  |  | 8352 |  |  |  |  |  |  |  |  |  |  |  | 12 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 14 |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3724 | 3767 |  |  | 15 |
| 16 | 6030 |  |  |  |  |  |  |  | 7971 | 15.7 | 2.503 | 5075 | 5121 | 516 | 5213 | 5259 | 530 | 53 | 5397 | 5443 | 16 |
| 17 | 7907 |  |  |  |  |  |  |  | 7845 |  | $2 \cdot 659$ | 6643 | 6692 | 6740 |  | 6838 |  |  |  |  |  |
| 18 | 778 |  |  |  |  |  |  | 7726 | 7 | 17.77 | 2.8158 | 8210 | 8262 | 8313 | 836 | 8417 |  |  |  |  | 18 |
| 19 |  | 7652 |  |  |  |  |  | 7600 | 7591 | 18.758 | $2 \cdot 97$ |  |  |  |  |  |  |  |  |  | 19 |
| 20 | 7538 | 7529 | 7519 | 75 | 7501 | 7492 | 74 | 7474 | 7464 | 19.745 | $3 \cdot 12$ | 134 | 1402 | 145 | 151 | 574 | 163 |  | 174 | 1804 | 20 |
| 21 | 7415 |  | 7395 | 73 | 7376 |  | 73 |  |  | 2 | 3.28 |  |  |  |  |  |  |  |  |  |  |
|  |  | 728 | 727 | 72 | 72 |  |  |  | 72 | 21. | 3.44 |  |  |  |  |  |  |  |  |  | 22 |
|  |  | 71 | 1 |  |  |  |  |  | 70 |  |  |  |  | 617 | 624 | 631 |  |  |  |  | 23 |
| 24 |  |  |  |  |  |  |  |  | 6957 |  | 375 |  |  |  |  |  |  |  |  |  | 24 |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 |
| 26 |  |  |  |  |  |  |  | 6716 | 6704 | $25 \cdot 6$ | 4.067 | 0748 | 108 | 0897 | 0972 | 1046 | 112 | 119 |  |  | 26 |
|  |  |  |  |  |  |  |  | 6589 | 6577 |  |  |  |  | 247 |  |  |  |  |  |  |  |
| 28 | 6553 |  | 65 | 6514 | 6502 | 6489 | 64 | 643 | 6450 |  | 4.38 |  |  | 404 | 412 |  |  |  |  |  | 28 |
| 29 |  |  |  |  |  | 6363 | 6350 | 63 | 6323 |  | - 5 |  | 55 |  |  |  |  |  |  |  | 29 |
| 30 | 6306 | 629 | 627 | 626 | 62 | 62 | 6224 | 6210 | 6196 | $29 \cdot 618$ | 4.69 | 701 | 7103 | 718 | 727 |  | 74 |  |  |  | 30 |
| 31 | 618 | 61 | 61 | 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 |  | 6 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 593 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 219 | 22 | 23 |  | 33 |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 35 | 56 | 567 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 36 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 36 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 5322 |  |  |  | 525 | 523 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 12 | 136 | 145 | 157 |  |  |  |  |  |
| 40 | 5075 | 5057 | 5039 | 5021 | 5002 | 4984 | 4966 | 4947 | 492 | 39. | 6.257 | 268 | 280 | 291 | 303 | 314 | 32 |  | 349 |  | 40 |
|  | 495 | 493 | 4915 | 489 | 48 |  |  | 48 | 480 |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 |  | 481 | 47 | 477 | 47 |  |  |  | 4 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 46 | 46 |  |  |  |  |  | 45 |  |  |  |  |  |  |  |  |  |  |  | 43 |
| 44 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 |  | 443 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 46 | 4337 | 4316 | 4295 | 4274 | 4253 | 423 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 42 | 419 | 417 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 53 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | 3844 | 382 | 379 | 3776 | 3753 | 3730 | 3707 | 3684 | 3661 | 49.363 | 82 | 836 | 85 | 864 | 879 | 893 | 90 |  | 93 | 95 |  |
| 51 | 372 | ${ }^{3698}$ | 367 | 365 | 36 |  |  | 35 | 353 | 50.35 | $7 \cdot 97$ |  |  |  |  |  |  |  |  |  |  |
| 52 |  | 357 | 35 |  |  |  |  |  |  | 51.33 | 813 |  |  |  |  |  |  |  |  |  |  |
| 53 | 3475 | 3451 | 342 | 3402 | 33 | 33 | 33 |  | 32 | $52 \cdot 32$ | d |  |  |  |  |  |  |  |  |  | 53 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 3229 | 32 | 31 | 31 | 312 |  |  |  |  | 54.30 | 8 |  |  |  |  |  |  |  |  |  |  |
| 56 | 3105 | 30 | 30 | 30 | 30 |  |  |  |  | 55.287 | 876 |  |  |  |  |  |  |  |  |  |  |
| 57 | 29 |  |  | 29 | 28 | 28 |  |  |  |  |  | 93 |  |  |  |  | 115 | 03 |  |  |  |
|  |  | 2833 |  |  | 27 |  |  |  |  |  |  |  |  |  | 139 |  | 173 | 189 |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 314 |  |  |  |  |  |
| 60 | 26 | 25 | 25 | 253 | 25 | 2476 |  | 24 | 23 | 59.236 | 9.386 | 403 | 42 | 43 | 4550 | 472 | 489 | 506 | 52 |  | 50 |
|  | 2490 | 246 | 243 | 24 | 23 |  |  | 229 | 226 |  | 9.542 | 56 |  |  |  |  |  |  |  |  |  |
|  |  | 23 | 23 | 2 |  |  |  |  | 21 |  |  |  | 739 |  |  |  | 805 |  |  |  |  |
| 63 | 22 | 22 |  |  |  |  |  |  | 21 | 62.19 |  | 873 | 89 |  |  | 945 |  |  |  |  | 63 |
|  | 21 |  |  | 20 | 20 | 1974 |  |  | 188 | 63.18 | 10.01 |  | 04 |  | 085 | 1037 |  | 14 | 15 |  | 64 |
| 65 | 1997 | 19 | 19 | 19 | 1879 | 184 | 181 | 178 | 175 | $64 \cdot 1$ | 10.16 | 186 | 20 | 2243 |  | 2616 |  |  |  |  |  |
|  | 1874 | 1844 | 18 | 1784 |  |  |  |  | 163 |  | 10327 |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 16 |  |  |  |  | 153 | 150 |  |  |  |  | 538 |  | 577 |  |  |  |  |  |
| 68 | 15 | 147 |  |  |  |  |  | 14 | 13 |  |  |  |  |  | 173 | 735 |  |  |  |  | 8 |
|  | 15 |  |  |  |  |  |  |  | 122 |  |  |  |  | 853 | 873 |  |  |  |  |  |  |
| 70 |  |  | 1318 |  |  |  |  | 1157 | 112 | 69.109 | 10.95 | ¢ |  | -107 |  |  |  | 091 |  |  |  |
| 71 |  | 122 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 229 |  |  |  |  |
| 72 | 1 | 11 | 时 | 193 | 1004 |  |  |  |  |  | 1 |  | 30 |  |  | ${ }^{3667}$ | 387 | 408 | 428 |  |  |
|  | 1012 | 097 | 09 | 0913 | 0879 | 0846 | 0812 | 077 | 074 | 73.15 | 11.41 |  | 46 | 48 |  | 524 |  |  |  |  | 73 |
| 74 | 088 | 0856 |  |  | 062 | 072 |  | 065 | 06 | $73^{\circ} \mathrm{O5}$ | 11.57 |  | 61 | 63 | 661 | 682 |  |  |  |  | 74 |
| 75 | 076 | 0732 | 06 | 06 | 06 | 05 | 05 | 052 | 04 | 74:043 | 11732 | 754 | 77 | 79 | 81 | 84 | 86 | 88 | 90 |  |  |
| 76 | ${ }^{065}$ |  | 0574 | 05 | 05 |  |  |  |  |  | 12. |  |  |  |  |  |  |  |  |  |  |
|  | 052 |  |  |  | 03 |  |  |  | 023 |  | 12.0 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 01 |  |  |  |  |  |  | 313 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 80 | 0151 | 0114 | 007 | 004 | -005 | 9968 | 993 | 98 | 98. | 78. | 12 | 5377 | 560 | 5837 | 6067 | 16297 | 6526 | 6756 | 698 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7643 |  |  |  |  |  |  |
|  |  | 9867 | 9830 |  |  |  |  |  | 9604 |  |  |  |  |  |  |  |  |  |  |  | 2 |
|  | 9781 | 9744 |  |  | 9630 950 |  |  |  | ${ }_{9350}^{947}$ | ${ }_{82}^{81}$ 82,93 |  | 16 | 188 |  |  |  |  |  |  |  |  |
| 85 | 953 | 9496 | 9458 |  |  | 934 | 9302 | 9263 | 922 | 83-91 | 13.29 | 32 | res | 3702 | ${ }_{3946}$ | 419 | 443 | 467 | 492 |  | 85 |
| 86 | 94 |  | 9334 | 9294 | 9255 | 9215 |  | 9136 | 9097 |  | $13^{\prime} 45$ | 478 |  | 52 | 532 | 5 | 601 |  | 65 |  |  |
|  |  | 92 |  |  |  |  | 9050 | 90 | 89 | $85^{8} 8$ | 13. | 634 | 6598 | 6848 | 7098 | 734 | 759 | 784 |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 86 | 13.7 |  |  |  | ${ }^{867}$ |  | 917 | 943 |  |  |  |
| 89 <br> 80 <br> 9 | 4043 | 88 | ${ }_{8837} 896$ | 88921 | ${ }_{8755}^{8880}$ | $87 / 4$ | 8672 | 863 | ${ }_{8589} 871$ | (878854 | 13.922 <br> 14.07 <br> 1 | 105 | 130 | 156 | 1825 | ${ }_{208}^{050}$ | 2342 | 1260 | 28. |  |  |
|  |  |  |  |  |  |  |  |  | 仡 |  | 14.2 | 26 |  |  |  | 366 | 392 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 93 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8427 |  |  |  |  |  |  |  |  |  |  | 731 | 758 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 15 | 202 |  |  |  |  |  |  |  |  |  |
| 98 |  |  |  |  |  | 7711 |  |  | 7575 | 96 | 15.330 | 358 | 386 | 415 | 4432 | 471 | 4995 |  |  |  |  |
|  |  |  |  |  |  |  | 7540 |  | 7448 |  | 5, | 5155 | 5439 | 518 | 5 |  | 6577 | 6861 | 14 |  |  |
|  | 7688 | 643 | 7597 | 7551 | 7506 | 7460 | 7414 | 7368 | 7322 | 98.7275 | 15.6435 | 6722 | 7009 | 7296 | 7584 | 7871 | 8158 | 8445 | 73 | 9020 |  |
|  | $60^{\circ}$ | 59 | $58^{\prime}$ | $57^{\prime}$ | $56^{\circ}$ | 55' | $54^{\prime}$ | $53^{\prime}$ | $52^{\prime}$ | $51^{\prime}$ | 60 | $59^{\prime}$ | 58 | $57^{\prime}$ | $56^{\prime}$ | $55^{\prime}$ | 5 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $9^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $9^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $11^{\prime}$ | $12^{\prime}$ | 13 | 14 | $15^{\prime}$ | $16^{\prime}$ | 17 | $18^{\prime}$ | $19^{\prime}$ | ， | $11^{\prime}$ | 12 | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | 16 | 17 |  |  |  |
|  | 9872 | 9872 | 987 | 19871 | 9870 | 987 | 9869 | 9869 | 9869 | ． 9868 | 1593 | 1596 | 1599 | 1602 | 1605 | 1607 | 1610 | 1613 | 1616 | 1619 |  |
|  | 9745 | 974 | 97 | 97 | 9741 | 97 | 97 | 9738 |  | 1.9 | 3186 | 3192 | 3198 | 3203 | 32 | 3215 | 32 | 32 | 3232 |  |  |
|  |  | 96 | 96 | 961 | 9611 | 26 | 9608 |  | 96 |  | － | 4788 | 4796 | 48 | 4814 | 4822 | 4831 | 488 |  |  |  |
|  | 9489 |  | 9485 | 948 | 9482 | 9480 | 9478 | 9476 | 94 |  | 6372 | 6384 | 6395 | 640 | 6418 | 6430 | 64 | 6453 | 64 |  |  |
|  | 936 | 935 | 935 | 9354 | 9352 | 9350 | 934 | 93 | 9343 | 4.93 | 7965 | 7980 | 7994 | 8008 | 8023 | 8037 | 8051 | 66 |  | 8095 |  |
|  | 9234 | 9231 | 9228 | 19225 | 9223 | 9220 | 9217 | 9214 | 9211 | 5.9208 | 9558 | 9576 | 19593 | 9610 | 9627 | 9645 | 9662 | 9679 | 9696 | 971 |  |
|  | 9106 | 9103 | 9100 | 9096 | 9093 | 9090 | 9086 | 9083 | 9080 | 6．9077 | 1.1151 | 1172 | 1192 | 1212 | 1232 | 1252 | 1272 | 1292 | 1312 | 133 |  |
|  | 8978 | 8975 | 8971 | 896 | 8963 | 8960 | 8956 | 8952 | 8948 | 7.8945 | 12745 | 2768 | 2790 | 2813 | 2836 | 2859 | 82 | 2905 | 2928 | 2951 |  |
|  | 8851 | 88 | 88 |  | 8834 | 88 | 8825 | 8 | 8 |  | 1.4338 | 4363 | 4389 | 44 | 44 | 4467 | 4493 | 4519 | 4544 | 4570 |  |
| 10 | 8723 | 871 | 8714 | 8709 | 8704 | 8700 | 8695 | 8690 | 868 | 9．868 | 1.5931 | 5959 | 5988 | 60 | 6046 | 6074 | 6103 | 6132 | 6160 |  | 10 |
| 11 | 8595 | 8590 | 85 | 858 | 8575 | 857 | 856 |  |  | 10 | 17524 | 75 | 7587 | 17 |  |  |  |  |  |  | 11 |
| 12 | 846 | 8462 | 84 | 845 | 8445 | 8440 | 843 | 842 | 8423 | 11. | 1.91 | 915 | 9186 | 922 |  | 92 |  | 9358 | 939 |  | 12 |
| 13 | 834 | 833 | 8328 | 8322 | 8316 | 8310 | － |  | 8291 | 12.82 | 2.07 | 0747 | 0785 | 0822 | 085 | 089 | 09 | 0971 | 1008 |  | 13 |
| 14 | 8212 | 820 | 8199 | 8193 | 8186 | 8179 | 8173 | 8166 | 8160 | 13.8153 | $2 \cdot 2303$ | 2343 | 2383 | 2424 | 2464 | 2504 | 2544 | 2584 | 625 | 2665 | 14 |
| 15 | 808 | 807 | 80 | 8063 |  | 80 | 8042 | 8035 | 802 | 14：8021 | $2 \cdot 3896$ | 3939 | 13982 | 4025 | 4068 | 4111 | 4154 | 4198 | 4241 |  | 15 |
| 16 | 7957 | 7949 | 7942 | 7934 | 7927 | 7919 | 791 | 7973 | 789 | 15.788 | 2.5489 | 5535 | ｜5581 | ｜5627 | 5673 | 5719 | 5765 | 5811 | 557 | 590 | 16 |
| 17 | 7829 | 782 | 78 | 7805 | 997 | 7789 | 7781 | 7773 | 7765 | 16.7757 | 2.7082 | 7131 | 7180 | 7229 | 727 | 7326 | 7375 | 7424 | 7473 | 7521 | 17 |
| 18 | 7701 | 769 | 76 | 7676 | 7668 | 7659 | 7651 | 76 | 7634 | 177626 | 2.8675 | 8727 | 8779 | 8830 | 88 | 8934 | 8985 | 9037 | 9089 |  | 18 |
|  | 7574 |  |  | 7547 | 75 | 75 |  |  |  |  |  | 03 | 037 | 043 | 04 | 0541 |  | 0650 |  |  |  |
| 20 | 744 | 7437 |  |  |  |  | 739 | 73 | 737 | 1973 | 3.18 | 1919 | 1976 | 2034 |  | 2149 | 2206 | 22 | 2321 | 2378 | 20 |
| 21 | 7318 |  |  | 7289 | 72 | 72 | 725 |  |  | 2072 | $3 \cdot 3$ |  |  |  |  |  |  |  |  |  | 21 |
| 22 | 719 | 71 | 71 | 7160 | 7149 |  |  | 7119 |  |  |  | 5111 | 5773 |  |  |  |  | 5490 | 5553 |  | 22 |
| 23 | 7063 | 70 | 70 | 7031 | 7020 |  | 69 | 6988 | 6977 | ${ }^{22} \cdot 6966$ | 3．6641 | ${ }^{6707}$ | ${ }^{6773}$ | 68 | 6905 | 6971 |  | 7103 |  |  | 23 |
| 24 | 693 | 692 | 69 | 6902 | 6890 | 6879 | 6868 | 6857 | 6845 | 23＇6834 | 3 3＇8234 | 8303 | 8371 | 8440 | 8509 | 8578 | 8647 | 8716 | 8785 |  | 24 |
| 25 | 680 | 6796 | 6784 | 6772 | 6761 | 6749 | 6737 | 6726 | 6714 | 24：6702 | 3.9827 | 9899 | 19970 | ． 042 | 011 | 0186 | 0257 | 0329 | 0401 | 0473 | 25 |
|  | 668 | 66 | 66 | ${ }^{6643}$ | 6631 | 6619 | 660 | 65 | 6582 | $25^{2} \cdot 65$ | 4.1420 | 1492 | 156 | 164 |  | 1793 | 1868 | 1942 | 20 |  | 26 |
| 27 | 65 | 65 |  |  | 65 | 64 | 6476 | 64 | 6451 | 26.64 | 430 |  | 316 | 32 |  | 3401 | 378 | 3556 |  |  | 27 |
| 28 | 6424 | 64 | 63 |  | 6372 | 6359 |  |  | 6320 |  |  |  | 4767 |  |  | 5008 |  | 5169 |  |  | 28 |
| 29 |  |  |  | 6256 |  |  | 6215 | 6202 | 6188 |  | $4 \cdot 61$ | 6282 | 636 | 644 | 65 | 6615 | 669 | 6782 | 68 |  | 29 |
| 30 | 6169 | 6155 | 6141 | 6127 | 6113 | 6099 | 6085 | 6071 | 6057 | 29.604 | $4 \cdot 7792$ | 咗 |  | 8 | 81 | 82 | 83 | ${ }^{\text {a }}$ | 84 |  | 30 |
| 31 | 6041 | ${ }_{5027}^{6027}$ | ${ }^{6012}$ | 5998 | 5983 | 5969 | 5954 | ${ }^{5940}$ | 5925 | 30．591 | 4.9385 | 9474 | 956 | 965 | 97 | 9830 | 991 | 1008 | 00 | 01 | 31 |
| 32 | 5913 | 58 | 58 | 90 |  | 58 | 58 | 58 | 5794 | 31.57 | 0978 | 1070 | 1162 | 12 | 13 | 1438 | 153 | 1621 | 17 |  | 32 |
| 33 | 5786 | 57 | 57 | 57 | 57 | 57 | 56 | 56 | 5662 | 32．5647 | 5.2571 | 2666 | 2761 | 285 | 29 | 3045 | 314 | 3235 | 3329 |  | 33 |
|  |  |  |  |  |  |  |  | 55 | 55 | $33 \cdot 55$ | 5.4164 | 4262 | 436 | 445 | 45 | 4652 | 475 | 484 | 4945 |  | 34 |
| 35 | 553 | 551 | 5498 | 5481 | 5465 | 5449 | 5432 | 54 | 5399 | 34．53 | 5.5757 | 585 | 59 | 605 | 61 | 626 | 636 | 64 | 6561 |  | 35 |
| 36 | 5402 |  |  | 5352 |  |  |  | 5285 | 52 | 35．52 | 5.7 | 7454 | 75 |  |  |  | 7971 | 8074 |  |  | 36 |
|  | 527 | 5 | 52 | 52 |  |  |  | 515 | 51 | $36 \cdot 5$ |  |  | 915 |  |  |  | 95 |  |  |  | 37 |
| 38 | 5147 | 51 | 51 | 5094 |  | 5059 |  | 50 | 50 |  | 6.05 | 0646 | 0755 |  | 09 | 1082 | 119 |  |  |  | 38 |
| 39 |  |  |  | 4965 |  | 4929 |  | 4892 | 4874 | 38．4855 | － 3732 | 2242 | 2354 |  | 2578 | 26 | 280 | 292 |  |  | 39 |
| 40 | 4892 | 4873 | 4855 | 4836 | 4817 | 4799 | 4780 | 4761 | 4742 | 39．4723 | $6 \cdot 3723$ | 3838 | 3952 | 406 | 4182 | 429 | 44 | 4527 | 464 | 4756 | 40 |
| 41 | 4764 | 4745 | 4726 | 4707 | 4688 | 4669 | 4649 | 4630 | 4611 | 40＇4592 | 6.5316 | 5434 | 5551 |  |  | 5904 | ${ }^{602}$ | 6140 | ${ }^{6258}$ |  | 41 |
| ， | 46 | 46 | 45 | 4578 | 4558 | 4538 | 4519 | 449 | 4479 | 41.446 | 6.690 | 7029 | 7150 | 72 | 739 | 7512 | 763 | 7753 | 7874 |  | 42 |
| 43 | 45 | 448 | 44 | 4449 | 4429 | 4408 | 43 | 436 | 4348 |  | $6 \cdot 85$ | 8625 | 87 | 88 | 89 | 9119 |  |  |  |  | 43 |
| 44 | 438 | 43 |  |  | 4299 |  |  |  | 42 |  |  |  | 03 |  |  | 072 |  |  |  |  | 4 |
| 45 | 425 | 42 |  | 4190 | 4169 | 4148 | 4127 | 406 | 4085 | 44.40 | 71688 | 1817 | 1947 |  | 2205 | 23 | 2463 | 2593 |  |  | 45 |
| 46 | 4125 | 410 | 408 | 4061 | 4040 | 4018 |  |  | 39 | $45 \cdot 39$ | 7.3281 | 3413 |  | 3677 |  | 39 | 407 | 420 | 43 | 44 | 46 |
| 47 | 319 | 39 | 39 | 3932 | 37 | 3888 | 3866 | 385 | ${ }^{3822}$ | $46 \cdot 38$ | 7. |  | 51 | 527 | 5414 | 55 | 5684 |  |  |  | 47 |
| 48 |  | 38 | 38 |  | 381 | 3758 | 37 | 3713 | 3691 | 47．366 | 7.6467 | 6605 | 674 | 688 | 862 |  |  | 432 |  |  | 48 |
| 49 | 37 | 37 |  | 3674 | 3651 | 3628 | 3605 | 3582 | 3559 | 48.35 | ． 8060 | 8201 | 834 | 8482 | 8623 | 8764 | 890 | 045 | 918 |  | 49 |
| 50 | 3615 | 359 | 356 | 13545 | 3522 | 3498 | 3475 | 3451 | 3428 | 49.344 | $7 \cdot 9653$ | 9797 | 994 | ．08 | 0228 | 0371 | 051 | 0658 | 0802 |  | 50 |
|  | 34 | 34 | 34 | ${ }^{3416}$ | 3392 | 33 | 3344 | 332 | ${ }^{3296}$ | $50^{\circ} 3$ | $8 \cdot 1247$ | 139 | 153 | 1686 | 183 | 197 | 21 | 22 |  |  | 51 |
| 52 | 33 | 33 | 33 | 3287 | 3262 | 32 | 3214 | 31 | 31 |  | 8．284 | 2989 | 31 |  |  | 35 | 373 |  | 40 |  | 52 |
| 53 | 323 | 32 | 31 | 31 | 3133 | 3108 | 3083 | 30 | 3034 |  | 8.4433 | 458 | 473 | 48 | 50 | 5194 | 534 | 54 |  |  | 53 |
| 54 |  |  |  |  |  |  |  |  | 2702 |  |  | ${ }^{618}$ |  |  | 66 |  | 6956 |  |  |  | 54 |
| 55 | 297 | 295 | 292 | 28 | 2874 | 2848 | 2822 | 2796 | 2771 | 54.27 | 8.7619 | 777 | 7935 | 80 | 82 | 84 | 8566 | 8724 | 8882 |  | 55 |
| 56 | 2848 | 2822 | 279 | 2770 | 2744 | 2718 | 269 | 2666 | 2639 | 55.26 | 8.9212 | 9373 | 9533 | 9694 | 985 | ．016 | 017 | 0337 | 10498 |  | 56 |
| 57 |  | 26 | 26 | 2641 | 2615 | 2588 | 2561 | 2535 | 2508 | 56.248 | 9．0805 | 0969 | 1132 | 1296 | 14 | 1623 | 178 | 1951 | 2114 |  |  |
| 58 | 25 | 25 | 25 | 2512 | 248 | 2458 | 2431 | 24 | 2376 | 57.23 | 9．2398 | 2565 | 2731 | 289 | 30 | 3231 | 3397 | 3564 | 53 |  | 58 |
| 5 | 2， | 2438 | 2410 | 23 | 23 | 2328 | 2310 | 22 | 22 |  | $9 \cdot 3991$ | 4160 | 4330 |  | 46 | 4838 | 5098 | 5177 | 53 |  | 59 |
| 60 | 2337 | 2310 | 2282 | 2254 | 2226 | 98 | 2170 | 142 | 2113 | 59．208 | 9.5584 | 5756 | 5929 | 6101 | 62 | 64 | 66 | 6790 | 6962 |  | 60 |
| 61 |  |  |  |  |  |  |  |  |  | 60．19 |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 2082 | 205 | 202 | 1996 | 1967 | 1938 | 1909 | 188 | 185 | 61 | 9．8770 | 894 | 912 |  | 94 | 96 | 983 | ${ }^{+01}$ | 01 |  | 62 |
| 63 | 195 | 192 | 18 | 1867 | 173 | 1808 | 1778 | 1749 | 1719 | $62 \cdot 1689$ | 10．0363 | 0544 | 0725 | 090 | 108 | 1268 | 144 |  |  |  | 63 |
|  | 182 | 17 | 1767 | 1737 | 1708 | 1678 | 1648 | 1618 | 1588 | 63：1558 | 10－1956 | 2140 | 232 | 250 | 2692 | 2875 | 305 | 324 | 342 | 361 | 64 |
| 65 | 1699 | 1669 | 1639 | 1608 | 1578 | 1548 | 1517 | 1487 | 1456 | 64．1426 | $10 \cdot 3549$ | 3736 | 392 | 410 | 4296 | 4483 | 466 | 485 | 50 | 52 | 65 |
|  | 1571 | 154 | 1510 | 1479 | 1448 | 1418 | 1387 | 1356 | 1325 | 65.129 | 10.514 | 5332 | ｜5522 | 57 | 59 | 6090 | 628 | 6469 | 66 |  | 66 |
|  | 144 | 141 | 13 | 1350 | 1319 | 1288 | 1256 | 1225 | 1193 | $66 \cdot 116$ | 10.67 | 6928 | 7120 | 73 | 75 | 7698 | 789 | 808 | 82 |  | 67 |
|  | 131 | 128 | 125 | 1221 | 1189 | 1158 | 1126 | 109 | 1062 | 67．10 | 10.83 | 8524 | 87 | 89 | 91 | 93 | 95 | 96 |  |  | 68 |
| 69 | 11 |  |  |  |  |  |  |  |  |  |  |  | 03 |  | 07 |  | 1110 |  |  |  |  |
| 70 | ） | 1 | ， | ¢93 | 0930 | O897 | O865 | 8032 | 199 | 69.076 | 11.15 | 1716 | 1917 | 218 | 2319 | 2 | 2721 |  | 仡 | 332 |  |
| 71 | 0933 | 090 | 0867 | 0834 | 0801 | 0767 | 0734 | 070 | 0668 | 70.06 | 11.31 | 3312 | 351 | 371 | 392 | 4127 | 43 | 4535 | 4739 |  |  |
| 72 |  | 07 | －7 | － 5 | Sl | O637 | 0604 | 957 | 0336 | 7250 | 11.4701 | 45 | 5174 | 53 | 5528 | 5735 | 751 | 6148 | 6355 |  | 72 |
| 73 | 067 | 06 | 060 | 0575 | 0541 | 0507 | 0473 | 0439 | 0405 | 72.037 | 11.6294 | 65 | 6713 | 6923 | 71 | 7342 | 755 | \％ | 795 | 81 | 73 |
| 74 | 0550 | 0515 | 0481 | 0446 | 0412 | 0377 | 0343 | 0308 | 0273 | 73.023 | 117887 | 810 | 8312 | 8525 | 87 | 8950 | 916 | 937 | 958 |  | 74 |
| 75 | 042 | 0387 | 0352 | 0317 |  | 0247 |  | 0177 | 0142 | 74.010 | 11.948 | 969 | 99 | 1126 | 03 | 05 | 0772 | 09 | 1203 |  | 75 |
| 76 | 029 | 025 | 102 | 018 | 0153 | 011 | 00 | 004 | 1010 | 74.99 | $12 \cdot 10$ | 1291 | 1510 | 17 | 19 | 21 | 23 | 260 | 28 |  |  |
|  | 016 | 013 | 0 | 005 | －023 | 998 |  | 99 | 98 | $75 \cdot 98$ | 12.26 | 2887 | 3109 | 33 | 35 | 3772 | 39 | 421 | 44 |  | 77 |
| 78 | 003 | －00 | 9966 | 9930 |  |  | 98 | 978 | ， | 76 | 12.4 | 4 | 仡 |  | 矿 |  | 503 |  | 6051 |  | 78 |
|  |  |  |  |  |  |  |  | 9633 | 9616 | 77.9579 | 12.5852 |  | 6306 | 6533 | 6 |  | 7213 |  |  |  | 79 |
| 80 | 9783 | 9746 | 9709 | 9672 | 9634 | 9597 | 9560 | 9522 | 9485 | 78.9447 | 12.7446 | 7675 | 7905 | 8135 | 836 | 8594 | 882 | 905 | 928 | 951 | 80 |
| 81 | 9656 | 9618 | 9580 | 9543 | 950 | 94 | 9429 | 9391 | 9353 | 79.93 | 12.903 | 92 | 9504 | 19736 | 19969 | ${ }^{202}$ | 0 | $0^{0667}$ | 089 |  |  |
| 82 | 952 | 948 | 945 | 94 | 9375 | 9337 | 929 | 9260 | 9222 | 80.9183 | 13.0632 | 0867 | 1103 | 1338 | 15 | 1809 | 2044 | 2280 | 2515 |  |  |
| 83 | 940 | 936 | 932 |  | 9246 | 9207 | 9168 | 9129 | 9090 | 81．905 | 13.2225 | 2463 | 270 | 294 | 317 | 3416 | 3655 | 3893 | 413 |  | 83 |
| 84 |  | 9233 | 919 | 915 | 91 | 907 | 903 | 899 | 8959 |  | 13.38 | 405 | 430 | 45 | 47 | 5024 | 5265 | 5506 |  |  | 84 |
| 85 | 9145 | 9105 | 906 | 9026 |  | 8947 | 89 | 886 | 8827 | 83 | $13 \cdot 54$ | 565 | 589 | 64 | 析 | 66 | 6875 | 711 | 7363 |  |  |
| 86 | 901 |  | ${ }^{8937}$ |  |  |  |  | ${ }^{8736}$ | ｜8696 | 84．865 | $13 \cdot 70$ | 72 | 748 | 774 | 7992 | 8239 | 8486 | 873 | 89 |  | 86 |
|  | 888 | 884 | 88 | 8768 | 8727 | 8687 | 8646 | 8605 | 8564 | $85 \cdot 852$ | 13.859 | － |  | 934 | 95 | 984 | ＋09 | ， |  |  |  |
| ${ }_{88}^{88}$ | 88 | ${ }_{85}^{87}$ | 8680 <br> 851 <br> 85 |  | 8598 | 557 | 8516 | 8474 | 8433 | 86：8392 | 14.0190 | 044 | 069 | 094 | 120 | 14 | 170 | 195 | 221 |  | 88 |
| 89 90 | 8506 | ${ }^{85464}$ | 8423 | 8381 | 8339 | ${ }_{8297}^{8427}$ | ${ }_{8255}^{8385}$ | 8812 | ${ }^{8302} 8170$ | 87－8260 |  | ${ }_{3635}^{2039}$ | 3294 | 2550 | $\left\|\begin{array}{l}2805 \\ 4410\end{array}\right\|$ | 3061 <br> 4688 | 3316 4927 | 5185 | ${ }_{5443}^{3827}$ | 570 | 89 90 |
|  | 83 | 8336 | 8294 | ${ }^{8252}$ | 209 | 8167 | 8124 | 18081 | 8039 | 89：7996 | $14^{*} 4969$ | 5231 | 15492 | 5753 | 60 | 6276 | 653 | 6798 | 7059 |  |  |
| 92 | 825 | 820 | 8165 | 8123 | 8080 | 8037 | 7994 | 7950 | 7907 | 90•7864 | 14．6562 | 6826 | 7091 | 7355 | 76 | 7883 | 814 | 8411 | 867 |  |  |
| 93 | 812 | 8080 | 8037 | 7993 | 7950 | 7907 | 7863 | 7820 | 7776 | 91.77 | $14 \cdot 81$ | 842 | 869 | 8957 | 92 | 949 | 975 | ＋025 | 029 |  | 93 |
| 94 | 硅 | 7952 | 7908 | 7864 | 7821 | 7777 | 773 |  |  |  |  |  | 0288 | 05 |  | 109 | 13 | 16 |  |  |  |
| 95 | 7868 |  | 777 | 7735 | 591 | 7647 |  | 7558 | 75 | 93.7468 | $15^{\circ}$ | 161 | 1887 | 216 | 243. | 2705 | 2978 | 3251 | 3524 |  |  |
| 96 | 774 | 7695 | 7651 | 7606 | 7561 | 7517 | 17472 | 7427 | 7381 | 94 | 15.29 | 321 | 3486 | ｜ 3762 ｜ | 1403 | 4313 | 458 | 4864 | 5140 | 5415 | 96 |
|  | 7612 | 756 | 75 |  | 7432 | 738 | 73 |  |  | 957 | 15 | 480 | 5085 | 5363 | 564 |  | 6199 | 6477 |  |  |  |
| 98 | 748 | 7439 |  |  |  | 7256 |  | 716 | 997 | 96．7073 | $15 \cdot 6121$ | 640 | 668 | 695 | 724 | 75 | 7809 | 809 | 8372 | 86 | 98 |
| 100 | 7229 | 183 | 7136 | 7090 | 7043 | 7126 | 6950 | 7036 6903 | 6987 | 97．694！ | （15．7714 | 7998 | 8282 981 | ${ }^{8567}$ | 8851 0456 | 9135 0743 | 9419 1030 | 9704 1317 | 1604 | 189 |  |
|  | $50^{\circ}$ | 49＇ | $48^{\prime}$ | 47＇ | $46^{\prime}$ | $45^{\prime}$ | 44 | $43^{\prime}$ | $42^{\prime}$ | 41 | $50^{\prime}$ | 49 | 48 | 47 | 46 | 45 | 44＇ | 43 | 42 | 41 |  |
| 80 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $80^{\circ}$ |

TRAVERSE TABLES．

| $9^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $9^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | $21^{\prime}$ | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | 25 | 26 | 27 | $28^{\prime}$ | 29 | $2{ }^{\prime}$ | $21^{\prime}$ | $22^{\prime}$ | $23^{\prime}$ | ＇ | $25^{\prime}$ |  |  |  |  |  |
|  | 986 | 9867 | 9867 | 9866 | 9866 | 986 | 9865 | 9864 | 986 | 9863 | 162 | 162 | 1628 | 1630 | 1633 | 1636 | 1639 | 1642 | 1645 | 648 |  |
|  | 973 | 9734 | 973 | 97 | 97 |  | 9730 | 9729 |  | 1.9727 | 244 | 3249 | 3255 | 3261 | 3267 | 3272 | 3278 | 3284 | 3289 | 3295 |  |
|  | 9 | 960 | 9600 |  | 9597 | 959 | 94 | 9593 | 959 | 2 | 865 | 487 | 4883 | 4891 | 4900 | 4908 | 4917 | 4926 | 493 | 4943 |  |
|  | 9470 | 9469 | 9467 | 65 | 9463 | 946 | 9459 | 457 | 945 | 3.945 | 487 |  | 6510 | 6522 | 6533 | 6545 | 65 | 656 | 657 | 65 |  |
| 5 | 9338 | 9336 | 9333 | 9331 | 9329 | 93 | 9324 | 9321 | 319 | 4.9 | 8109 | 8123 | 8138 | 8152 | 8166 | 8181 | 819 | 820 | 8224 | 823 |  |
|  | 9206 | 92 | 92 | 9197 | 9194 | 91 | 9189 | 86 | 9183 | 5.9180 | 731 | 9748 | 97 | 9782 | 9800 | 9817 | 9834 | 98 | 886 | 9886 |  |
|  | 907 |  |  |  |  |  |  |  |  |  | $\cdot 1352$ | 1373 | 1393 | 1413 | 1433 | 453 | 1473 | 1493 | 1513 | 153 |  |
|  | 89 | 8937 | 893 | 8930 | 8926 | 89 | 8918 | 89 | 89 | 7.89 | －2974 | 299 | 3020 | 30 | 30 | 30 | 1 | 3135 | 3158 | 318 |  |
|  |  |  |  |  |  |  |  |  | 8774 | 8．877 |  | 4622 | 4648 | 4674 | 46 | 4725 | 475 | 477 | 4803 |  |  |
| 10 | 867 | 71 |  |  | 8657 | 8652 |  |  | 8638 | 9.8633 | 1.6218 | 6247 | 6275 | 6304 | 6333 | 361 | 639 | 6419 | 644 | 6476 |  |
| 11 | 85 | 85 | 85 | 8528 | 8523 | 8518 | 8512 | 8507 | 8502 | 10 | 17840 | 787 | 7903 | 7934 | 7966 | 7997 | 029 | 8061 | 8092 | 812 |  |
| 12 | 84 | 840 | 84 | 83 |  |  | 83 | 83 | 83 |  |  | 9496 | 9530 | 95 | 95 | 9634 | 9668 | 97 | 9737 | 977 |  |
| 13 | 827 | 827 | 82 | 826 | 82 |  | 82 | 82 | 82 | 12.82 |  | 112 | 1158 | 1195 |  |  | 130 | 1344 | 1382 | 141 |  |
| 14 | 81 | 81 | 813 | 8127 | 8120 | 8 | 810 | 8100 | 8093 | 13 | 22705 | 27 | 27 | 28 | 28 | 2906 | 29 | 2 | 3026 | 306 |  |
| 15 |  |  |  |  |  |  | 7972 |  | 7957 | 14.795 | 327 | 437 | 441 | 44 | 44 | 4542 | 458 | 46 | 4671 | 47 | 15 |
| 16 | 7882 | 7874 |  |  |  |  |  |  |  |  |  | 599 |  |  |  | 6178 | 6224 | 62 | 6316 | 636 | 16 |
| 17 | 77 |  | 7733 | 7725 | 7717 |  |  |  |  |  |  |  |  |  |  | 左 | 7863 | 7912 |  |  |  |
| 18 | 76 |  | 7600 | 7592 | 7583 | 757 |  | 7557 | 7549 | $17 \cdot$ | 2918 | 924 | 92 | 9347 | 9399 | 9450 | 950 | 95 | 9605 | 965 |  |
| 19 | 748 |  |  |  |  |  |  |  |  | 18 |  | 0868 | 09 | 0977 | 1032 | 1086 | 114 | 119 | 25 |  |  |
| 20 | 735 | 7343 | 733 | 324 | 7314 | 7305 | 7295 | 7286 | 7276 | 72 | 3.2436 | 2493 | 2550 |  |  | 2723 | 2780 | 2837 | 2895 | 295 |  |
| 21 | 722 | 7210 | 72 | 7190 | 7180 | 7170 | 7160 | 7150 | 7140 | 20 | $3 \cdot 4057$ | 4118 | 417 | 4238 | 4298 | 4359 | 4419 | 4479 | 4539 | 4600 |  |
| 22 |  |  |  |  |  |  |  |  |  | 21 |  |  |  |  |  |  |  | 61 | 6184 |  |  |
| 23 | 695 | 69 | 693 | 6923 | 69 |  |  |  | 6868 | $22 \cdot 68$ |  |  |  |  |  | 7631 | 7697 | 77 |  |  |  |
| 24 | 68 | 68 | 68 |  | 67 | 676 | 675 | 6743 | 732 | $23 \cdot 6$ | 389 | 89 | 906 | 9129 | 9198 | 926 | 9336 | 9405 | 9474 | 954 |  |
| 25 |  |  |  |  |  |  |  |  | 6595 | 24.6 | 4.0544 | 061 |  |  | 0832 | 0903 | 0975 | 1047 | 1118 | 119 |  |
| 26 | 655 | 6546 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2614 |  |  |  |  |
| 27 | 642 | 64 | 6400 | 638 | 637 |  |  |  |  | 26 |  |  |  |  |  | 4175 |  |  |  |  |  |
| 28 | 62 |  |  |  | 624 |  |  |  | 6187 | $27 \cdot 61$ | 4.54 |  | 557 |  |  | 5812 | 5892 | 597 | 6053 | 6133 | 28 |
| 29 | 616 |  | 613 |  | 6106 |  |  |  | 605 | $28 \cdot 603$ |  |  |  |  |  |  | 7531 |  |  |  |  |
| 30 | 6028 | 60 | 6000 | 986 | 5972 | 595 | 59 | 5929 | 591 | $9 \cdot 590$ | 4.8653 | 8740 | 882 | 89 | 8998 | 908 | 917 | 9256 | 9342 | 942 |  |
| 31 | 5896 | 5881 | 5867 | 5852 | 5837 | 58 | 5808 | 5793 | 5778 | 30．576 | 5.0275 | 0364 | 045 | 0542 | 0631 | 0720 | 0809 | 0898 | 0987 | 107 |  |
|  | 57 |  |  | 5718 |  |  |  |  |  | 31.56 |  |  |  |  |  |  |  | 2540 |  |  |  |
| 33 | 563 | 56 | 5600 | 5584 | 5569 | 5553 | 553 | 5522 |  | 32 |  | 3613 | 370 |  |  |  | 4087 | 418 |  | 437 |  |
| 34 |  |  |  |  | 5435 |  |  |  |  | 33 |  | 523 | 5336 |  | 5531 | 5628 | 572 | 582 | 5921 | 601 |  |
| 35 | 536 | 535 |  | 5317 |  |  |  |  |  | 34．5217 | 5.67 | 6863 |  |  |  |  | 7365 | 7465 | 7566 |  |  |
| 36 | 523 | 5217 | 5200 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 37 | 510 | 50 | 5067 |  | 5032 | 501 |  | 4979 |  | 36.4 |  | 01 | 02 |  |  | 05 | 06 | 0749 |  |  |  |
|  | 49 |  |  | 4915 | 48 |  |  | 4843 | 482 | $37 \cdot 48$ |  |  |  |  |  | 217 | 228 | 23 |  |  |  |
| 39 | 483 | 481 | 4800 | 4782 | 476 | 47 | 472 |  |  | 38. |  | 33 | 34 | 35 | 369 | 380 | 392 | 403 | 414 |  |  |
| 40 | 470 | 468 | 4667 | 4648 | 462 | 4610 | 45 | 4572 | 4553 | 39. | 6487 | 4986 | 510 | 521 | 533 | 5445 | 556 | 567 | 579 | 597 | 40 |
| 41 | 4572 | 4553 | 4533 | 4514 | 4495 | 4475 | 4456 | 4436 | 4416 | 40.439 |  | 661 |  | 6846 |  | 708 | 7199 |  |  |  |  |
|  | 44 | 44 |  |  |  |  |  |  | 4280 | 4 |  | 8235 |  |  |  |  | 8838 | 8958 |  |  |  |
| 43 | 430 | 428 | 42 | 42 | 42 | 42 | 41 | 41 | 41 | $42 \cdot 4$ |  | 98 |  | ＋1 |  | 03 | 047 | 06 | 0724 | 8 |  |
|  | 417 | 41 | 41 | 4113 | 40 |  | 405 | 40 | 4008 | $43 \cdot 39$ |  | 148 | 16 |  |  | 19 | 211 | 22 | 2368 | 249 |  |
| 45 | 40 |  |  | 3979 | 3957 |  |  |  | 3872 | 44385 | 7.29 | 310 | 3238 |  | 3497 | 362 | 3755 | 3884 | 4013 | 414 | 45 |
| 46 | 39 | 388 |  | 3845 | 3823 |  |  |  |  | $45 \cdot 37$ |  |  |  |  |  |  |  |  |  |  |  |
| 47 | 37 | 375 |  |  |  |  |  |  |  | 46 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 3577 | 3555 | 3532 |  |  | 3463 | 47．3470 |  | 79 | 8121 |  |  | 8534 | 86 |  |  |  |  |
| 49 | 35 |  |  | 344 |  |  | 33 |  | 3327 |  |  | 96 | 97 |  | ＋ | 18 | 031 | 045 | 059 | 073 |  |
| 50 | 33 | 33 | 33 | 3310 | 3286 | 326 | 323 | 32 | 3191 | 49.316 | ． 108 | 23 | 13 |  |  | 180 | 195 | ， | ， |  | 5 |
| 51 | 324 | 3224 |  | 317 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 31 | 309 | 30 | 3042 | 3018 |  |  |  | 2918 | 51.28 |  | 4482 |  |  |  |  |  |  |  |  |  |
| 53 | 29 | 29 |  |  |  |  |  |  |  | 52.27 |  | 61 | 62 |  |  | 67 | 68 | 70 | 717 |  |  |
|  |  | 28 |  | 2775 |  |  |  |  | 析 | $53 \cdot 26$ |  | 773 |  |  |  |  | 850 | 86 |  |  |  |
| 55 | 271 | 2693 |  | 2641 | 2615 | 2589 |  | 25 | 2510 | 24 | 8.919 | 935 |  |  |  |  | ＋145 | 03 |  | 06 | 5 |
| 56 | 25 |  |  |  |  |  |  |  | 2374 | 55 |  | 098 | 11 |  | 1463 | 162 | 1784 |  |  |  |  |
|  | 24 |  |  | 2373 | 2346 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 2322 | 2294 | 226 | 2239 | 2212 |  |  |  | 2101 | 57 |  | 42 |  |  |  |  | 5062 |  |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  |  |  | 58 | 60 |  |  |  |  |  |  |  |  |
| 60 | 20 | 2029 | 2000 | 1972 | 1943 | 1915 | 1886 | 18 | 182 | 59 | 9.7307 | 7479 | 76 | 78 |  | 81 | 83 | 85 | 868 | 88 | 60 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 17 | 176 | 1734 | 17 | 1675 | 1645 | 16 | 158 | 1557 | $61 \cdot 1$ | 10 | 0728 | 0906 |  |  |  | 1618 |  |  |  |  |
| 6 |  |  | 16 | 15 | 154 |  |  |  | 12 |  | 10.2 | 235 | 25 |  |  |  | 3257 | 仡 |  |  |  |
| 64 | 152 |  | 1467 |  | 1406 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 65 | 139 | 136 | 133 | 1303 | 1272 |  | 12 | 117 | 1148 | 64．1117 | 10 | 560 |  |  |  |  | 6535 | 672 |  |  | 65 |
| 66 | 12 |  |  |  |  |  |  |  |  |  |  | 7227 |  |  |  |  | 81 | ， 6 | 859 |  | 66 |
|  |  |  |  |  |  |  |  |  |  |  |  | 885 |  |  |  | 96 |  | ＋ | 01 |  |  |
| 6 | 09 | 09 | 093 | 0901 | 086 | 0837 | 080 | 077 | 073 |  | 11.02 | 04 | 067 |  |  | 125 |  | 16 | 184 |  | 68 |
|  |  |  |  |  |  |  |  |  | 0603 | 68.05 | $11 \cdot 19$ | 210 | 22 |  |  | 28 | 309 | 328 | 3487 |  | 69 |
| 70 | 07 |  |  |  |  | 056 |  |  |  | 69．043 | 11.3525 | 372 | 392 | 417 | 432 | － | 4730 | 493 | 513 | 533 | 70 |
|  | － |  |  |  | 046 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 046 | 043 | 04 | 03 | 033 | 029 | 02 | 02 | 019 | 71.0160 | 11.67 | 697 | 718 |  | 7595 | 780 | 8008 | 8214 | 842 | 86 | 72 |
|  | 03 |  |  |  | 0198 | 0163 |  |  | － | 72.00 | 11.8 | 859 | 880 |  | 9228 | 9437 | 964 | 9856 | ＋06 |  | 73 |
|  | 020 | 0169 | 01 | 0099 | 663 | ＋028 | 999 | 9958 |  |  |  | 12 | 04 |  |  | 107 | 1286 |  |  |  |  |
| 75 | 00 | 0036 |  | 9965 | 9929 |  |  | 9822 | 9786 | $73 \cdot 97$ | $12 \cdot 163$ | 184 | 20 | 22 | 249 | 271 | 292 | 31 | 335 | 357 | 75 |
|  |  | 99 | 9867 | 9831 | ） |  |  | 9686 | 9650 | 74．9614 | 12.32 | 347 | 592 | 5910 | 412 | 434 | 456 | 478 | 500 |  | 76 |
|  |  |  |  |  |  |  |  |  |  |  |  | S098 | 5 | 5810 |  |  | 203 | ¢ | 硅 |  |  |
| 78 | 9674 | 9637 | 960 | 9563 | 9526 | 948 | 9452 | 9415 | 9378 | 76.934 | $12 \cdot 64$ | 6723 | 6947 | 717 | 739 | 761 | 7842 | 8066 | 829 | 85 | 78 |
|  |  |  |  |  |  |  |  |  | 9241 |  |  | 8347 | 8574 | 880 | 902 | 925 | 48 | 9708 | 993 | ＋181 | 79 |
| 80 | 9409 | 9371 | 9334 | 9296 | 9258 | 9220 | 9182 | 9143 | 9105 |  | 12.974 | 9972 | ＋202 | 043 |  | 258 | ， | 349 | 157 | 18 | 80 |
| 81 | 927 | 9239 | 9200 | 2 | 9123 | 9085 | 析 |  |  |  |  |  | 182 |  |  | 252 | 275 | 299 |  |  |  |
| 8 | 914 | 910 | 90 | 9028 | 89 | 89 | 89 | 88 | 8833 | $80 \cdot 879$ | 13.298 | 322 | 345 |  | 3927 | 416 | 43 | 463 | 486 | 510 |  |
|  | 901 | 8973 | 893 | 889 | 8855 | 8815 | 876 |  | 8897 |  |  | 484 | 508 |  | 556 | 57 |  | 27 | 651 | 675 |  |
| 8 | 888 | 884 | 880 | 87 | 8721 | 868 | 864 | 86 | 8560 | 82．8520 | $13 \cdot 62$ | 647 | 6712 | 695 | 7194 | 743 | 7676 | 7917 | 8158 | 839 | 84 |
| 85 | 87 | 8707 |  |  |  |  |  |  | 8424 | 83.8384 | 13 | 09 | 833 | 8583 | 88 | 90 | 931 | 955 | 98 | 1047 | 35 |
| 86 | 861 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 120 | 1447 |  | 86 |
| 87 | 848 |  |  | 8359 | 8318 | 8276 | 823 | 81 | 8152 | 85.710 | 142717 | 促 | 1594 | 1844 | 2096 | 234 | 咗 | 2843 | 仡 | 334 | 87 |
| 88 | 835 | 83 | 82 | 82 | 81 | 8142 | 8100 | 8058 | 8016 | $86 \cdot 7974$ | 14.2717 | 2969 | 3222 | 34 | 3727 | 397 | 4232 | 4484 | 473 |  | 88 |
| 89 | 8218 | 176 | 24 | ， |  |  |  | 772 |  | 7837 |  | 4594 | 484 | 573 |  | 561 | 5810 | ， | 析 |  | 89 |
| 90 | 8085 | 8043 | 8000 | 7958 | 15 | 872 | 7829 | 7786 | 7743 | 88.7700 | 14.596 | 6219 | 647 | 673 | 保 | 725 | 7510 | 776 | 802 | 8285 | 9 |
| 9. | 7953 | 7910 | 7867 | 7824 | 7781 | 7737 | 769 | 51 | 7607 | 89.7564 | 14.7582 | 7843 | 8104 | 836 | 86 | 888 | 9149 | 941 | 967 | 993 |  |
| 92 | 7821 | 7777 |  | 㖪 | 7646 | 7603 | 7559 | 7515 | 747 | $90 \cdot 7427$ | 14.9204 | 9468 | 9732 | 999 | ＋2 | 052 | 078 | 052 | 131 |  |  |
| 93 | 7688 | 7644 |  | 7556 | 75 | 7468 | 7424 | 7379 | 733 | 91.7290 | 15.0825 | 1092 | 135 | 1626 | 189 | 2160 | 2427 | 2694 | 296 | 322 | 93 |
| 94 | 755 | 75 | 7467 | 22 | 7378 | 7333 | 7288 | 7244 | 7199 |  | 15.2447 | 2717 | 2987 | 3257 | 35 | 379 | 4066 | 4336 | 460 | 487 |  |
| 95 | 742 |  |  |  |  |  |  |  |  |  | 15．4069 |  | 4614 | 4887 | 5160 |  |  | 5977 |  |  | 95 |
| 96 | 7291 | 7746 | ， |  |  |  |  |  |  |  |  | 5966 | 624 | 8178 |  | 7068 |  |  | 矿 |  | 96 |
| 97 | 715 | 71 | 706 | 702 | 697 |  | 688 | 683 | 679 | 95.6744 | 15.7313 | 7591 | 78 | 8148 | 8426 | 8705 | 8 | ， | 954 | 981 |  |
|  | 7026 | 6980 | 34 |  | 析 | 6794 | 6747 | 6 | 6654 | ．660 | 15.8934 | 9216 | 9497 | 9778 | －05 | 034 | 0622 | 0903 | 184 | 46 | 98 |
|  | 6894 | 68 |  |  | 6706 |  | 66 |  | 518 | 97．6470 | 16.0556 | 084 | 1124 | 140 | 1693 | 1977 | 226 | 2545 | 2829 | 3113 |  |
| 100 | 6762 | 6714 | 6667 | 6620 | 6572 | 6525 | 6477 | 6429 | 6382 | 98.633 | 16.2178 | 2465 | 2752 | 3039 | 3326 | 3613 | 3900 | 4187 | 4474 | 4761 | 100 |
|  | 40 | 39 | 38 | $37^{\prime}$ | 36 | 35 | 34 | $33^{\prime}$ | $32^{\prime}$ | $3 \mathrm{I}^{\prime}$ | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ |  | 36 | $35^{\prime}$ | 34 | 3 | $32^{\prime}$ | $31^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $9^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $9^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | 34： | $35^{\prime}$ | 36 | 37 | 38＇ | $39^{\prime}$ | $30^{\circ}$ | 31＇ | 32 | 33 | $34^{\prime}$ | $35^{\prime}$ | 36 | 37 | $38^{\prime}$ | 39 |  |
|  | 9863 | 9862 | 9862 | 9861 | 9861 | 98 | 9860 | 9859 | 9859 | 9859 | 1650 | 1653 | 1656 | 1659 | 1662 | 16 | 16 | 167 | 16 | 1676 |  |
| 2 | 9726 | 972 | 9724 | 9723 | 9722 | 9721 | 9720 | 9719 | 9718 | 1.971 |  |  | 33 | 3318 | 332 | 33 | 53 | 3341 | 3347 |  |  |
|  | 95 | 9587 | 9586 | 9584 | 95 | 95 | 9580 |  | 95 |  |  |  | 49 | 4977 | 4986 | 4994 | 5003 | 5012 | 5020 | 5020 |  |
|  | 94 | 94 |  |  |  |  |  | 9438 |  |  | 602 | 66 | 6625 | 663 | 6648 | 665 | 667 | 6682 | 6694 | 6705 |  |
| 5 | 9314 | 9312 | 9309 | 9307 | 05 | 9302 | 9300 | 9297 | 9295 | 4.9 | 52 | 82 | 8281 | 8295 | 8310 | 33 | 8338 | 8353 | 8367 | 8381 |  |
| 6 | 9177 | 917 | 917 | 9168 | 9166 | 9163 | 9160 | 9157 | 9154 | 5. | 903 | 9920 | 9937 | 9954 | 9972 | 9989 | 1006 | 0023 | 0041 | 0058 |  |
|  | 9040 | 90 | 90 |  |  |  |  | 9016 |  |  | 155 | 1573 | 1593 |  | 1634 | 1654 | 167 |  | 极 | 1734 |  |
|  | 8903 | 88 | 88 | 8891 | 88 | 8884 | 8880 | 8876 | 8872 |  |  | 3227 | 3250 | 3273 | 3296 | 3319 | 33 | 3364 | 33 | 3410 |  |
| 9 | 87 | 87 | 875 |  |  |  | 8740 |  | 873 |  |  | 4880 | 490 | 49 | 4958 | 498 | 5009 | 5035 | 5061 | 5087 |  |
| 10 | 86 | 8624 | 8619 | 8614 | 8609 |  | 8600 | 8595 | 8590 | 9.8 |  |  | 6562 | 6591 | 620 | 664 | 6671 | 6706 | 6734 | 6763 | 0 |
| 11 | 49 | 8486 | 848 |  | 8470 |  |  | 8454 | 8449 | 10•8444 | ． 8155 | 8187 | 8218 | 8250 | 8281 | 8313 | 8345 | 8376 | 8408 | 843 | 11 |
| 12 | 835 | 83 | 834 |  | 8331 | 8325 |  | 8314 | 8308 | 11.8 | 980 | 98 | 987 |  |  | 9978 | － | 7 |  |  | 12 |
| 13 | 8217 | 821 | 82 | 8198 | 81 | 8186 | 8179 | 8173 | 8167 | 12.8 | 145 | 14 | 15 |  | 160 | 1643 | 1680 |  | 1754 | 179 | 13 |
| 14 | 808 | 8073 |  |  |  | 8046 | 8039 | 8033 | 8026 |  |  | 31 | 31 | 32 | 326 | 3307 | 3348 | 3388 | 3428 |  | 14 |
| 15 | 79 | 7936 | 7928 |  | 7914 | 7907 | 7899 | 7892 | 7885 | 14.787 | 47 | 480 | 48 | 48 | 492 | 4972 | 5015 | 5058 |  |  | 15 |
| 16 | 780 | 77 | 7790 | 7783 | 75 | 7767 | 7759 | 7752 | 7744 | 15 | 2.6408 | 6454 | 6499 | 6545 |  | 66 | 66 | 29 | 6775 |  | 16 |
| 17 | 76 |  |  |  |  |  | 7619 | ， | 7 | 16759 |  | 8107 | 8156 | 8204 | 8253 | 83 | 8351 | 8399 | 8448 | 849 | 17 |
| 18 | 753 | 7523 | 7514 |  |  | 7488 | 7479 | 471 | 746 | $17 \cdot 745$ |  | 97 | 98 | 9863 | 9915 | 99 | 10 | 0070 | 0122 | 017 | 18 |
| 19 | 73 | 7385 |  |  |  |  |  | 7330 |  | 18.731 | 13 | 1414 | 14 | 15 | 1577 | 16 | 1686 | 174 | 1795 | 185 | 19 |
| 20 | 72 |  |  |  |  |  |  |  |  | 19717 |  | 067 | 3124 | 318 | 3239 | 32 | 3354 | 341 | 346 | 352 | 20 |
| 21 | 7120 | 7110 | 7100 |  |  |  |  |  |  | 20.7029 | 34660 | 4720 | 4780 | 484 | 490 | 496 | 5021 | 5082 | 514 | 202 | 21 |
| 22 | 69 | 6972 | 69 | 6951 | 6940 | 69 | 691 | 690 |  |  |  | 6374 | 643 |  | 6563 |  |  | 6752 |  |  | 22 |
| 23 | 68 | 683 |  |  |  | 67 |  | 6768 | 67 | $22 \cdot 67$ | 79 | 80 | 80 | 81 | 82 | 82 | 83 | 8423 | 8489 | 855 | 23 |
| 2 | 67 | 669 |  |  |  | 665 | 6639 | 66 | 66 | $23 \cdot 660$ | 3.96 | 96 | 97 | 98 | 98 | 99 | ＋024 | 009 | 0162 | 023 | 24 |
| 25 | 657 | 65 | 6547 | 6535 | 6523 | 6511 | 649 | 648 | 6475 | $24 \cdot 6463$ | －1262 | 13 | 140 | 1477 | 15 | 1620 | 692 | 176 | 1836 | 190 | 25 |
| 26 | 643 | 6422 | 6409 | 6397 | 6384 | 6372 | 6359 | 6346 | 6334 | 25.632 | 4.2912 |  |  |  |  |  |  |  |  |  | 26 |
| 27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 48 |  | 5028 |  |  |  | 27 |
| 28 | 616 | 61 | 613 | 6120 | 6106 | 60 | 607 | 606 | 605 | $27 \cdot 60$ | 462 | 62 | 6374 | 64 | 65 | 66 | 66 | 677 | 6856 |  | 28 |
| 29 | 60 |  |  |  |  |  |  |  |  |  | ＇7864 | 79 | 803 | 811 | 819 | 8280 | 836 | 844 | 8529 | 36 |  |
| 30 | 5886 | 587 |  |  |  |  |  |  | 5770 | 29.575 |  | 960 | 968 | 977 | 985 | 994 | ＋03 | 011 | 020 | 028 | 30 |
| 31 | 574 | 5734 |  |  |  |  |  |  |  |  | 5.16 | 125 | 134 | 143 | 1520 | 1609 | 1698 | 1787 | 1876 | 196 |  |
| 32 | 561 | 559 | 558 | 5565 | 5550 | 553 | 551 |  | 548 |  |  |  |  |  | 31 | 3274 | 336 | 345 | 3550 |  | 32 |
| 33 | 547 |  |  |  | 11 | 5395 | 53 |  |  | 32 | 4466 |  | 465 | 475 | 4844 | 4939 | 5034 | 512 | 5223 |  | 33 |
| 34 | 533 | 532 | 5304 |  | 5272 | 525 | 52 | 52 | 5206 |  |  | 6214 | 631 | 640 | 6506 | 66 | 6701 | 679 | 6896 |  | 34 |
| 35 | 5200 | 518 | 5166 |  | 51 | 5116 |  | 5082 | 5065 | 34 | 5.7767 | 78 | 796 | 8068 | 8168 | 8269 | 8369 | 3469 | 8570 | 867 | 35 |
| 36 | 5063 | 5046 | 5028 | 5011 | 499 | 4976 | 4959 |  | 4924 | $35^{\circ} 490$ |  | 9520 |  |  |  |  |  |  |  |  |  |
|  | 49 | 490 | 48 | 4872 |  | 483 | 4819 |  |  | 36． 476 |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 478 | 477 | 475 | 4734 | 4715 | 469 | 4678 | 46 | 4642 | 37 | ． 2718 | 282 | 2936 | 304 | 3154 | 3263 | 3372 | 348 | 3590 |  | 38 |
| 39 | 46 | 46 | 46 |  | 4576 | 45 | 45 |  |  | 38.44 |  | 4480 | 4592 |  | 4816 | 4928 | 504 | 15 | 526 |  |  |
| 40 | 45 | 4495 | 447 | 4456 | 4437 | 4418 | 4398 | 4379 | 4360 | 39．4340 |  | 6134 | 6249 | 636 | 6478 | 6593 | 670 | 6822 | 693 | 705 | 40 |
| 41 | 4377 | 43 | 433 | 431 | 4298 | 4278 |  | 423 |  |  | $6 \cdot 767$ |  |  | 802 | 8140 | 8258 |  |  |  |  |  |
| 42 | 424 | 422 | 42 | 41 | 4159 | 413 | 4118 |  | 407 |  |  |  |  | 968 |  |  | 043 | 163 |  |  | 42 |
| 43 | 41 | 40 |  | 4041 | 4020 |  | 3978 |  | 3936 | $42 \cdot 39$ |  |  | 121 | 134 | 1464 | 158 | 171 | 183 | 195 | 208 |  |
| 44 | 39 | 394 |  |  |  | 38 | 38 | 3817 | 37 | 43 |  | 27 | 2873 | 300 |  | 325 | 33 | 350 | 363 |  |  |
| 45 | 382 | 380 | 378 |  | 3742 | 372 | 36 | 36 | 36 | 44.363 | －4271 | 440 | 45 | 4659 | 4788 | 4917 | 5046 | 5175 | 5304 | 543 | 45 |
| 46 | 3691 | 3669 | 3647 | 3625 | 3603 | 3580 |  |  |  | 45．3491 | － 5922 | 6054 |  |  |  |  |  |  |  |  |  |
| 47 | 35 | 353 |  |  | 3464 | 3441 | 341 |  |  | $46^{\prime} 33$ | 512 |  |  |  |  | 82 |  | 851 |  |  |  |
| 48 | 34 |  |  |  |  |  |  |  |  | 47 |  |  |  |  |  |  | ＋049 | 018 |  |  |  |
| 49 | 32 |  |  |  |  | 162 |  | 31 | 3090 | －30 | 0873 | 1014 |  | 129 | 1336 | 157 | 71 | 857 | 988 |  |  |
| 50 | 31 | 311 | 3095 | 3071 |  | 22 |  | 297 |  | $49 \cdot 292$ | ． 2524 | 2667 | 281 | 295 |  | 324 | 338 | 135 | 367 | 38 | 5 |
| 51 | 300 |  |  |  |  | 2883 | 285 |  |  |  |  | 4 |  |  |  | 49 |  |  |  |  |  |
| 52 | 28 |  |  |  |  | 27 |  |  |  |  |  |  |  | 62 |  |  |  | 686 |  |  |  |
| 53 | 27 |  | 2680 |  | 2629 | 2604 |  |  |  | －25 | 74 | 7627 |  |  | 8083 | 8235 | 83 | 853 | 869 | 8 |  |
| 54 | 259 |  |  |  |  |  | 24 | 24 | 23 | 53 |  |  |  |  |  |  |  | 0210 |  |  |  |
| 55 | 2457 |  |  | 2378 | 2351 | 2324 | 229 | 227 | 22 | 54.221 | $0 \cdot$ | 09 | 108 | 1250 | 1407 | 1565 | 1723 | 188 | 2038 |  | 55 |
| 56 | 2320 | 2293 |  |  |  | 218 |  |  |  | $55^{\prime 2} 207$ |  |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 21 | 215 | 2128 | 2100 | 2073 | 2045 | 201 |  | 1962 | 56 |  | 424 |  |  | 4731 | 48 | 50 | 522 | 538 |  |  |
| 58 | 20 |  |  |  |  |  |  |  | 18 |  |  |  |  |  |  |  | 672 | 689 |  |  |  |
| 59 | 19 |  |  |  |  |  |  |  |  |  |  |  |  |  | 8055 | 322 | 839 | 856 | 873 |  |  |
| 60 | 1771 | 1743 | 171 | 1685 | 165 | 162 | 1598 | 15 | 1539 | 15 | 9.9029 | 20 | 937 | 9545 | 971 | 988 | P061 | 023 | 040 | 05 |  |
|  | 163 |  |  |  |  |  |  | 14 |  |  |  | 085 |  |  | 13 |  |  |  |  |  |  |
| 62 | 149 |  |  |  | 1378 | 1318 | 1 |  | 12 | $6 \cdot$ |  |  |  |  |  | 32 |  |  |  |  |  |
| 63 | 136 |  |  |  | 1239 |  |  |  |  |  |  |  |  |  |  | 488 | 50 |  |  |  |  |
| 64 | 122 |  |  | 113 | 109 | 1068 | 103 | 10 | 09 | 63.0 |  | 58 |  |  |  | 65 |  |  |  |  |  |
| 65 | 1086 |  |  |  |  |  |  |  |  | D80 | 10.72 |  |  |  |  | 析 |  |  |  |  |  |
| 66 | 09 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 08 | 07 | 07 |  | 0682 | 0650 | 061 |  | 05 |  | 11.05 |  |  |  |  |  |  | 1927 |  |  |  |
|  | 06 |  |  |  |  |  |  |  | 0411 | 67 | $11 \cdot 2$ | 242 | 262 |  |  | 3208 | 3403 | 359 |  |  |  |
| 69 | 053 |  |  |  |  | 0371 | 0 |  |  |  |  |  | 427 |  | 4675 | 487 | 507 | 526 | 54 | 568 | 69 |
| 70 | 04 | 036 | 0333 | 0299 | 0265 | 023 | 019 | 016 | 0129 | 69.009 | 11.55 | 573 | 593 | 613 | 633 | 65 | 6738 | 693 | 714 | 734 | 70 |
|  | 02 |  | 0194 | 0160 |  | 0092 | 00 | ${ }^{+023}$ | 998 | 69.99 | 11.71 | 738 | 759 |  |  | 8202 | dota |  |  |  |  |
|  | ， |  |  |  |  |  |  |  |  | 70.98 |  |  |  |  |  |  | 1073 |  |  |  | 72 |
| 73 | 998 | 995 | 991 | 98 | 9848 | 9812 | 9777 | 974 | 970 | 71.96 | 12.04 | 069 | 090 | 111 | 132 | 153 | 174 | 195 | 216 | 23 | 73 |
| 74 | 98 | 9816 |  |  |  | 9673 | 9637 | ， | 9565 | $72 \cdot 95$ | 12.21 | 2348 | 256 | 277 | 298 | 319 | 340 | 362 | 383 |  | 74 |
| 75 | 9714 | 9678 | 961 | 960 | 570 |  |  |  |  | 73.93 |  |  | 42 |  |  | 析 | 507 |  |  |  | 75 |
| 76 | 9577 | 9541 |  |  |  | 9394 |  |  | 928 |  |  |  |  |  |  | 65 | 674 | 962 |  |  | 76 |
| 77 | 9440 | 940 | 93 | 9329 | 92 | 925 | 9217 | 9180 | 9142 | 75.91 | $12 \cdot 70$ | 730 | 752 |  | 797 | 819 | 841 | 863 | 85 |  | 77 |
| 78 | 9 |  |  |  |  |  | 9077 |  | 900 | $76 \cdot 89$ | $12 \cdot 87$ | 896 | 918 | 940 | 963 | 985 |  | 仡 | 052 |  | 78 |
| 79 | 9166 | 912 | 909 | 9052 | 13 | 8975 | 893 | 889 | 8860 | $77 \cdot 88$ | 13.038 | 0614 | 084 | 106 | 1294 | 1521 | 174 | 197 | 220 | 24 | 79 |
| 80 | 9028 | 8990 | 8952 | 8913 | 8874 | 8836 | 879 | 875 | 8719 | 78.868 | 13．2038 | 2268 | 249 | 272 | 29 | 318 | 34 | 3644 | 3874 | 410 | 80 |
|  | 889 | 8852 | 8813 | 8774 |  | 8696 | 8657 | 8617 | 8578 | 79.85 | $13 \cdot 36$ | 392 | 415 |  | 46 | 4850 | 508 |  |  |  |  |
|  | 8754 | 8 | 86 |  |  |  | 8517 | 8477 |  | － |  | 557 | 81 |  | 62 | 6515 | 675 |  | 722 |  | 82 |
| 8 | 8617 | 8577 | 853 | 849 | 8457 | 8417 | 8377 | 8336 | 829 | 81.825 | $13 \cdot 69$ | 7228 | 746 | 770 | 7942 | 818 | 8418 | 865 | 885 | 913 | 83 |
|  | 8480 | 8440 |  |  |  | 8277 | 8237 | 8， | 815 | 82.811 | 13.864 | 888 | 912 | 936 | 960 | 984 | ＋08 | 327 | 056 |  | 84 |
| 85 | 8343 | 8302 | 826 | 8220 | 81 | 8138 | 8097 |  |  |  |  |  |  |  |  | 1510 | 175 | 199 | 224 |  |  |
| 86 | 8206 | 8164 | 8123 | 8081 | 8040 | 7998 | 7957 |  | 7873 |  |  |  |  |  |  | 174 | 342 | 析 | 391 |  | 86 |
| 87 | 806 | 802 | 79 | 7 | 79 | 7859 | 781 | 777 | 7732 | $85 \cdot 769$ | 14.359 | 384 | 409 | 4340 | 459 | 483 | 50 | 533 | 55 |  | 87 |
| 88 | 793 | 775 | 770 |  | 762 |  | \％ 57 | 7634 | 7591 | $86 \cdot 7548$ | 14 | 5494 | 574 |  | 6252 | 650 | 6756 | 硣 | 263 | 75 | 88 |
| 89 | 779 | 775 | 770 | 766 | 7623 | 7580 | 7536 | 7493 | 7450 | $87 \cdot 7407$ | 14.6892 | 7148 | 7403 | 765 | 7914 | 816 | 8424 | 867 | 893 |  | 89 |
| 90 | 765 | 7614 | 7570 | 7527 | 7484 | 7440 | 7396 | 73 | 7309 | 88.7265 | 14－8543 | 880 | 905 | 931 | 9576 | 983 | ＋092 | 03 | 06 | 08 | 90 |
| 9 | 753 | 733 | 7 |  |  |  | 7256 |  | 7168 | 712 | 15.019 | 045 |  |  |  | 149 | 176 | 202 |  |  | 91 |
| 9 | 738 | 73 | 7294 | 7250 | 7205 | 7621 | 6976 | 6931 | 7027 |  | 5． 154 | 270 | 237 | 263 | 28 | 3163 | 342 | 369 | 5 | 42 | 92 |
|  | 724 | 720 | 7156 | 7111 | 7066 | 7021 | 6976 | 693 | 6886 | 91．684 | 15.349 | 3761 | 4028 | 429 | 4561 | 4828 | 509 | 5362 | 562 |  | 93 |
|  | 708 |  | 7018 | 693 | 6927 | 6882 | 6836 | 6391 | 6745 | 92.669 |  | 5414 | 568 | 595 | 622 | 6493 | 6763 | 7032 | 730 |  | 94 |
| 95 | 6971 | 692 |  | 6834 | 6788 | 6742 | 630 | 6650 | 6604 |  |  |  |  | 7613 |  | 8158 | 843 | 8703 | 897 |  | 95 |
|  | 6834 | 67 | 6742 | 6696 | 649 | 6603 | 556 | 6510 | 6463 | 94．6416 | $15 \cdot 8446$ | 8721 | 899 | 927 | 954 | 9823 | 1098 | 0373 | 064 | 092 | 96 |
|  | 6697 | 6650 | 604 | 6557 | 6510 | 6463 | 6416 | 6369 | 6322 | $95 \cdot 627$ | 16.009 | 0374 | 065 | 093 | 120 | 1487 | 1766 | 204 | 232 | 260 | 97 |
| 98 | 656 | 651 | 646 | 6418 | 6371 | 63 | 627 | 622 | 6181 | 96． | 16.1747 | 2028 | 230 | 259 | 287 | 3152 | 3433 | 5385 | 566 | 205 | 98 |
|  | 6423 | 6375 | 6328 | 80 | 6232 | 6184 | 6136 | 6088 | 6040 | $97 \cdot 5992$ | $16 \cdot 3397$ | 3681 | 3965 | 4249 | 4533 | 4817 | 5101 | 5385 | 566 | 595 | 99 |
| 00 | 6286 | 623 | 6189 | 141 | ${ }^{6}$ | 6185 | 5996 | 5948 | 5899 | 98.5850 | $16 \cdot 5048$ | 5335 | 5621 | 5908 | 6195 | 6482 | 6769 | 056 | 34 | 7629 | 100 |
|  | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | 27 | $26^{\prime}$ | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ | 22 | ${ }^{\prime}$ |  | 29＇ | 28＇ | $27^{\prime}$ | 26 | 25 | $24^{\prime}$ |  |  |  |  |
| 80 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Cos | Int |  |  |  |  |  |

TRAVERSE TABLES．

| $9^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $9^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 40 | $41^{1}$ | 42＇ | $43^{\prime}$ | ｜ $44^{\prime}$｜ | $45^{\prime}$ | 46 | 4 |  | 49 | $40^{\prime}$ | $41^{\prime}$ | $42^{\prime}$ | $43^{\prime}$ | ， |  |  |  |  |  |  |
|  | 9858 | 9858 | 985 | 9857 | 9856 | 9856 | 9855 | 985 | 98 | ． 985 | 1679 | 1682 | 1685 | 1688 | 1691 | 1693 | 1696 |  |  |  |  |
|  |  | 97 | 971 | 971 | 9712 | 9711 | 97 |  |  |  | 3358 | 3364 |  | 337 | 3381 | 3387 |  | 3398 | 3404 |  |  |
|  | 9574 | 9573 |  | 9570 |  |  |  |  |  |  | 37 | 5046 | 5055 | 5063 | 5072 | 5080 | 5089 | 5098 | 5106 |  |  |
| 4 | 9432 | 9430 | 9428 | 9426 | 24 | 9422 | 9420 | 9418 | 9416 |  | 17 | 6728 | 67 | 6751 | 6763 | 6774 | 6785 | 6797 |  |  |  |
|  |  |  |  | 9283 |  |  |  |  |  |  | 8396 | 8410 | 8424 | 8439 | 8453 | 8467 | 8482 | 8496 |  |  |  |
| 6 | 9148 | 9145 | 9142 | ｜9139 | 19136 | 9133 | 9130 | 9127 | 9124 | 5.9121 | ． 0075 | 0092 | 0109 | 0127 | 0144 | 0161 | 0178 | 0195 | 0213 | 10230 |  |
| 7 | 9006 |  |  | 96 | 8992 | 8989 | 8985 | 8982 |  | 6．8975 | 1.1754 | 1774 | 1794 | 1814 | 1834 | 1854 | 1875 | 1895 | 1915 |  |  |
|  | 8864 | 88 | 8856 | 8852 | 8848 | 8844 | 8841 | 8837 | 8833 | 7．882 | 1.3433 | 3456 | 3479 | 350 | 35 | 354 | 357 | 3594 | 3617 |  |  |
|  |  | 87 | 8713 | 8709 | 8704 | 87 | 869 | 8691 | 8687 | 8．8682 | 12 | 5138 | 5164 | 519 | 52 | 52 | 52 |  | 5319 |  |  |
| 10 | 8580 | 8575 | 8570 | 8565 | 8561 | 8556 | 8551 | 8546 | 8541 | 9853 | 1.6792 | 682 | 6849 | 687 | 690 | 693 | 69 | 6992 | 7021 | 7050 |  |
| 11 | 8438 | 8433 | ${ }^{8427}$ | ${ }^{8422}$ | 8417 | 8411 | 8406 | 8400 | 8395 | $10 \cdot 838$ | 1.8471 | 850 | 853 | 8565 | 859 | 86 | 8660 | 研 |  |  |  |
| 12 | 829 |  |  | 8279 | 8273 | 82 | 8261 | 8255 | 824 | 11 | 2.0150 | 018 | 021 | 025 |  | 03 | 035 |  | 0425 |  |  |
| 13 | 815 | 81 | 81 | 8135 | 812 | 81 | 8116 | 8109 | 8103 |  |  | 186 | 1904 | 1941 | 197 | 2015 | 2053 | 2090 |  |  | 13 |
| 14 | 80 |  |  |  |  |  |  |  |  |  |  |  |  | 36 | 36 | 370 | 3749 |  |  |  |  |
| 15 | 787 | 7863 | 7856 |  |  |  |  |  |  |  |  |  | 5273 | 5316 |  | 5402 | 5445 | 5488 | 5531 |  | 15 |
| 16 | 772 | 7750 | 7713 |  |  | 7689 |  |  |  |  | 2．6867 | 6912 |  | 7004 | 7050 | 709 | 7142 | 7188 | 7234 |  | 16 |
| 17 | 75 | 75 | 742 | 7561 |  |  |  |  |  |  |  | 8594 | 8643 | 8692 | 8741 | 8789 | 8838 | 8887 | 9936 |  |  |
| 18 | 74.4 | 7435 | 7427 | 7418 |  | 7400 |  | 7382 | 737 | 17 | ． 0225 | 0276 | 0328 | 0380 | 043 | 04 | 053 | 586 | 0638 |  | 8 |
| 19 | 73 |  |  |  |  |  | 7246 | 7237 | 7228 | 18. | 3．1904 | 1958 | 201 | 206 | 212 | 217 | 2231 | 2285 | 2340 |  |  |
| 20 | 7100 |  |  | 7131 | 121 |  |  | 091 | 7082 | 19.7072 | 3.3583 | 364 | 369 | 375 | 3813 | 3870 | 3927 | 3985 | 04 |  |  |
| 21 | 7018 | 7008 | 6998 | 6987 | 6977 | 6967 | 6956 | 6946 | 6936 | 20．692 | 3.5262 | 532 | 538 | 5443 | 5503 | 5563 | 56 |  |  |  |  |
| 22 | 689 | 68 | 6855 | 6844 | 6833 | 6822 | 6811 | 68 | 6790 | 21.67 | 3．6941 7 | 7005 | 7068 | 7131 |  | 72 | 73 |  |  |  |  |
| 23 | 6734 | 6723 |  |  |  |  | 66 | 6655 | 664 | 22. | 8621 | 868 | 87 | 881 | 88 | 89 | 90 |  | 9148 |  | 2 |
| 24 | 659 | 65 | 65 |  | 6545 | 6533 | 6522 | 6510 |  |  |  |  | 04.3 | 050 | 05 | 06 |  |  |  |  | 24 |
| 25 | 6450 |  |  |  |  |  |  |  |  |  | $4 \cdot 1$ | 2051 |  | 2194 |  |  |  |  |  |  |  |
| 26 | 6308 | 6296 | 6283 |  |  | 6245 | 6232 | 6219 |  |  |  |  |  |  |  | 40 | 4105 | 418 | 14254 |  | ${ }^{26}$ |
| 27 28 | 616 | 61 |  |  |  |  |  |  |  | 27 |  |  |  |  |  |  |  | 7578 |  |  | ${ }_{28}^{27}$ |
| 28 |  |  |  |  |  |  |  |  | 5914 |  |  |  |  |  |  | 7418 | 749 | 878 |  |  | 28 29 29 |
| 30 | 57 | 5726 | 57 | 5696 | 5682 | 5667 | 5652 | 5637 | 5622 | 29.560 | 5.0375 | 04 | 0547 | 063 | $\begin{array}{\|} 9028 \\ \hline 0719 \\ \hline \end{array}$ | 0805 | 0891 | 0977 | 1063 |  | 30 |
| 31 | 5598 | 5583 | 5568 | 5553 | 5538 | 5522 | 5507 | 5492 | 5476 | $30 \cdot 54$ | 5：2054 | 214 | 223 | 23 |  | 2498 | 25 |  |  |  | 31 |
| 32 | 54 | 54 | 5425 |  | 5394 | 53 | 5362 | 5346 | 5331 | 31.53 | ． |  |  |  |  | 4192 | 4284 | 4375 |  |  |  |
|  |  |  |  |  |  | 52 | 5217 | 5201 | 5 | 32．51 | 5.54 | 5507 | 56 |  | 570 | 5 |  | 607 |  |  | 33 |
| 34 |  | 5156 |  | 5122 |  |  |  | 5056 |  |  |  | 718 |  |  | 7481 |  | 7676 | 77 |  |  | 34 |
| 35 | 503 | 5 | 4996 |  |  |  |  | 4910 |  |  | 5.8 | 887 | 8971 | 9072 | 9172 | 9272 | 9373 | 9473 | 9573 |  | 35 |
| 36 | 488 | 48 | 48 | 4836 | 4818 | 48 | 47 | 47 | 4747 | 35 | 6.0450 |  |  |  |  |  |  |  |  |  |  |
|  | 474 | 47 |  | 4692 | 4674 |  | 4 | 46 |  |  |  |  | 23 | 24 |  |  | 27 | 2031 | 2978 |  |  |
| 58 | 460 | 45 | 4567 |  |  |  | 4493 |  |  |  |  |  |  |  |  | 435 | 4462 | 4571 | 4680 |  |  |
| 39 | 44 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 4321 | 43 | 4281 | 4262 | 4242 | 4222 | 4203 | 4183 | 4163 | 39.4143 | 6.7166 |  |  |  |  |  | 1854 |  |  |  |  |
| 41 | 4179 | 4158 | 4138 | 4118 |  | 4078 | 4058 | 403 | 4017 |  | 8846 | 896 |  |  |  |  | 95 |  |  |  | 1 |
| 4 |  |  |  |  |  |  |  |  |  | 41 |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 3 | 38 | 3853 |  |  | 3789 | 3768 | 3747 | 372 | $42 \cdot 37$ | 220 | 232 | 24 | 257 | 析 |  |  |  |  |  |  |
| 44 |  | 37 | 3710 |  |  |  | 3623 | 3601 | 3579 | 43 | 7.3883 | 4009 | 413 | 42 | 43 | 15 | 4640 | 47 |  |  |  |
| 45 | 36 | 35 | 3567 |  | 3522 |  |  |  | 343 | 44 | 75562 | 56 | 5820 | 5949 | 6078 | 6207 |  | 646 |  |  | 5 |
| 46 | 34 | ${ }^{3446}$ |  |  | 3378 | 33 | 33 | 3310 | 3288 | 4532 |  | 953 |  |  |  |  | 8033 | 8164 |  |  | $\frac{46}{46}$ |
|  | 3327 |  | 3281 |  |  | 321 | 3188 | 3165 |  | $46 \cdot 31$ | $7 \cdot 8920$ |  | 91 |  |  | 9594 | 972 |  |  |  |  |
| ， | 318 | 31 | 3138 | 3114 |  | 30 | 3043 | 30 |  | 47 | ． 0600 | 073 | 087 | 101 | 115 | 1288 | 142 |  | 170 |  | 48 |
| 49 |  |  |  |  |  |  |  | 2874 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | 290 | 2876 | 2852 | 2827 | 2803 | 2778 | 2753 |  |  | 49.267 | 8．3958 |  | 4245 | 4388 | 4531 | 4675 | 4818 | 4961 | 5105 |  |  |
| 51 | 2759 | 2734 | 2709 | 26 | 2659 | 2634 | 26 | 2 | 2558 | 50.2 | 8.5637 |  | 59 |  | 6222 |  | 6514 |  |  |  | 51 |
| 52 |  |  |  |  | 2515 |  | 24 | 24 | 2412 |  | 87316 |  |  |  |  |  | 8211 |  |  |  |  |
| 53 | 247 | 2449 | 2423 |  |  | 2345 | 2319 | 2292 | 2266 | 52．220 |  | 91 |  | 945 | 960 |  |  | 1 | 0211 |  |  |
| 54 |  |  |  |  |  |  | 2174 | 2147 | 2120 | 53．209 | 9．0675 | 281 | 2 | 113 | 1294 | 1449 | 160 | 175 |  |  |  |
| 55 | 2191 | 2164 | 13 | 2110 | 2083 | 2056 |  | 2002 | 1974 | 54．194 | 9．2354 | 251 | 26 | 28 | 2985 | 3142 | 3300 |  | 3615 |  | 55 |
|  |  | 2021 |  |  |  |  |  |  |  | 55.180 |  | 419 | 435 | 45 | 4675 | 483 | 49 | 5157 | 5317 |  | 56 |
| 57 |  |  |  |  |  |  |  | 1711 | 16 | $56 \cdot 16$ | 9.5 | 5075 |  | 6 | 6 |  | 6693 | 6856 |  |  |  |
| 58 | 176 | 173 | 1708 |  |  | 16 |  | 1565 | 15 |  |  |  |  |  |  |  | －38 |  | 812 |  |  |
| 59 | 162 | 159 |  |  |  | 147 |  |  | $1391$ |  |  |  |  |  |  |  |  |  |  |  | 5 |
| 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 11 | 1166 | 1136 | 1106 | 1075 | 10 | 1014 | 098 | 095 | 61.092 | $10^{10.41}$ | 4286 |  | 46 | 4819 | 4997 | 5174 | 53 | 5530 |  |  |
| 63 |  |  |  |  |  | 0900 | 086 | 083 | 0807 | ${ }^{62} 20$ | $10 \cdot 57$ |  |  | 6329 | 6510 |  |  |  |  |  |  |
| 64 |  |  |  |  |  | 0756 | ， | －937 | 061 | 63.062 | 10.74 | 765 | 783 | 8017 | 820 | 838 | dest |  |  |  |  |
| 65 | 0771 | 0739 | 0707 | 0675 | 0643 | 0611 | 0579 | 0547 | 0515 | 64．048 | 10.9145 | 9332 | 9518 | 9704 | 989 | ${ }^{1077}$ | 0264 | 10450 | 0636 |  | 5 |
| 66 | 0629 |  | 0564 | 0532 | 0499 | 046 | 0434 | 040 | 03 | 65．033 | 11.0824 | 1014 | 1203 | 1392 | 1581 | 1771 | 1960 | 2149 | 2338 |  | 6 |
| 67 | 04 | 04 | 0421 |  | 03 | 0323 | 0290 | 0256 | 0223 | 67 | 11.25 | 26 | 26 | 30 | 3272 | 3464 |  | 55 |  |  |  |
| 68 | 0345 |  |  |  | 0212 |  | 0145 | 0111 | 0077 |  | 11. | 43 | 457 | 47 | 4963 | 518 | 5353 | 55 | 57 |  | 68 |
| 69 | 0203 |  |  |  |  |  |  |  | $\begin{aligned} & 9931 \\ & 9786 \end{aligned}$ |  |  |  | 62 |  |  |  | ${ }_{8745} 704$ |  |  |  | 69 |
| 70 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 977 | 97 | 97 | 9671 | 9636 |  | 95 | 95 |  |  |  | 11 | 1312 | 151 |  | 023 | 213 | O43 | 2551 |  |  |
| 73 | 963 |  |  |  |  | 9456 | 94 | 93 | 9348 | 71.9 | $12 \cdot 25$ | 2788 | 29 | 3207 |  | 362 | 38 | 4044 | 4253 |  | 73 |
| 74 | 9493 | 9457 |  |  |  | 9312 | 9275 | 92 | 920 | $72 \cdot 91$ | 12.4258 | 447 | 4682 | 489 |  |  |  |  |  |  | 74 |
| 75 | 9351 | 9314 | 927 |  | 9204 | 9167 | 9130 | 9093 | 956 | $73 \cdot 91$ | $\underline{12.5937}$ | 6152 | 6367 | 6582 | 年 | \％ | 7227 | 7442 | 7657 | 787 | 75 |
| 76 | 92 | 9172 | 9135 | ｜9097 | 9060 | 902 | 89 | 8948 | ${ }^{8910}$ | 1748 | $12 \cdot 76$ | 7834 | 8052 | 8270 | 8488 | 8706 | 8924 | 9141 | 935 |  | 76 |
| 77 | 906 | 9 | 89 | 8954 | 8976 | 87 | 8840 | 8802 | 8764 | 75.8 | 12.9 | 95 | 97 | 9958 | 178 | 0399 | 0620 | ${ }^{0841}$ |  |  |  |
|  |  |  | 8849 |  | 8772 | 8734 |  | 865 | 8618 | $76 \cdot 8$ | 13.0 | 11 | 14 | 16 | 1869 | 2093 | 2316 | 254 | 27 | 29 |  |
| 暏 | 87 |  |  |  |  |  | 805 | 836 | 832 |  |  |  | 47 | 3333 |  |  |  |  |  |  |  |
| 80 | 8641 |  |  |  |  | 8445 | 8405 | 8366 | 8326 | 78.828 | 13.4333 | 4562 | 47 |  |  |  |  |  | 16168 |  | 30 |
| 81 | 84 | 8459 | 8420 | ${ }_{8}^{8380}$ | ${ }^{8340}$ | 8815 | ${ }_{8116}^{8261}$ | 820 8075 |  |  |  |  |  |  |  |  |  |  |  |  | 81 |
| 82 | 83 | －17 | ${ }^{8277}$ | ${ }^{8237}$ |  |  |  |  |  | ${ }_{81}{ }^{81}$ | ${ }_{1} 1$ |  |  | ${ }_{\text {P084 }}^{8396}$ | ${ }^{863}$ | 88 |  | 933 | 1272 |  |  |
| 83 84 84 | ${ }_{8}^{82}$ | 81 | 8134 7991 |  |  | 88012 | 7826 | 7784 |  |  |  |  | 1531 | 17 | 2013 |  |  |  |  |  | 33 |
| 85 | 7931 | 7890 | 7848 | 780 | 765 | 723 | 7881 | 7639 | 7597 | ${ }_{83} 755$ | 14.2729 | 2972 | 3216 | 3460 | 3703 | 347 | 419 | 4434 | 4678 | 迷 | ${ }_{85}$ |
| 86 |  | 7747 |  |  | 17621 | 7578 | 7536 | 7493 | 7451 | ${ }^{84.74}$ | 14.4 | 4654 | 4901 | 514 | 5394 | 5641 | 5887 | 6134 | 6380 |  | 86 |
| 87 | 7647 | 76 | 752 | 7519 | 7477 | 7434 | 7391 | 7348 | 7305 | 85＇72 | 14．6087 |  | 65 | ${ }_{8}^{8835}$ | 8775 | 9028 |  |  |  |  |  |
|  | 75 |  |  | 7376 |  | 7145 | 7246 7101 |  | 7159 | $86 \cdot 7115$ 87.6969 | 14.7766 14.9445 | 870 | ${ }^{827}$ | ＋211 | 8775 0466 | ${ }^{9028}$ | 92 | 95 |  |  |  |
| 89 <br> 90 | 72 | 7177 | 133 | 7089 | 7045 | 7000 | 6956 | 6912 | 6867 | ${ }_{88}^{88} 882$ | ${ }_{1}^{15 \cdot 1124}$ | 1382 | 1640 | 1898 | 2157 | 2415 | 2673 | 293 | 318 | 34 |  |
|  | 7079 | 7035 | 16980 | 694 |  | 6856 | 68 |  | 6721 | 89．66 | $\frac{15.2803}{15}$ | ${ }^{3064}$ | ${ }^{33}$ | ${ }^{35}$ | ${ }^{3847}$ | 14108 | 4369 |  |  |  |  |
|  |  |  |  | 680 | 6757 | 67 | 665 | 6621 | 6575 | 90.653 | 15.4 | 4746 | 50 | 523 | 553 | 5802 | 60 | 632 | 659 |  |  |
| 93 | 679 | 675 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 94 | 651 | 6465 |  | 6515 |  | 62 | 6376 623 | 6185 | ${ }_{6138}^{6283}$ | 92.623 93.609 | 15.7841 15.9520 | 9792 | ${ }_{0}^{836}$ | ${ }_{0}$ | 061 | 08 | 1454 | 1427 | 169 |  |  |
|  | 6369 |  |  | ［6228 | ｜6181 | 6134 | 6087 | 6039 | 5992 | 94. | 16.1 | 1474 | 1750 | 20 | 230 | 257 | 285 | 3126 | 3403 |  |  |
|  | 6227 | 6180 | 6132 |  |  |  |  |  |  | 95 | $16 \cdot 2878$ | 1 | 3435 |  |  |  |  |  |  |  |  |
| 9 | 608 | 603 |  |  |  | 5845 | 5797 |  |  | ${ }^{96}$ |  |  |  |  | ${ }_{7372}^{5682}$ |  |  |  |  |  |  |
|  | 593 | 5752 | 570 | 5654 | 5605 | 5556 | 5652 | 5457 | 5408 | 97.5505 98.5358 | 16.6237 16.7916 | ${ }_{8203}^{6521}$ | 8489 | 8776 | 9063 | 9350 | 19636 | 9923 | 210 | 0496 | ${ }^{99}$ |
|  |  |  |  |  | 16 | ${ }^{15}$ |  |  | $12^{\prime}$ | ${ }^{111^{\prime}}$ |  |  |  | ${ }^{17}{ }^{\prime}$ | 16 | 15 | 14＇｜ | $\left\|13^{\prime}\right\|$ | $12^{\prime}$ | $11^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $9^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $9^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 50 | $51^{\prime}$ | 52 | 53 | $54^{\prime}$ | $55^{\prime}$ | S | $57^{\prime}$ | $58^{\prime}$ | $59^{\prime}$ | $50^{\prime}$ | $51^{\prime}$ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | $56^{\prime}$ |  |  |  |  |
|  | 98 | 98 | 985 | 9852 | 9851 | 98 | 9850 | 9850 | 9849 | ＇984 | 1708 | 171 | 1714 | 171 | 1719 | 1722 | 1725 | 1728 | 1731 | 1734 |  |
|  | 970 | 970 | 970 | 9703 | 9702 | 97 |  |  |  |  |  | 342 |  | 3433 | 3439 | 3444 | 3450 | 345 | 346 | 3467 |  |
|  | 9559 | 9558 | 9556 | 9555 | 9553 | 9552 | 95 | 9549 | 95 |  |  | 5132 | 5141 | 5149 | 5158 | 51 | 5175 | 518 | 51 | 5201 |  |
|  | 9412 |  |  |  |  | 94 |  | 398 | 9396 | 3．939 | 831 | 684 | 685 | 6866 | 6877 | 68 | 690 | 6912 | 69 | 6934 |  |
|  | 926 | 9263 |  | 258 | 255 | 9253 | 9250 | 9248 | 9245 | 4.9243 | 8539 | 8553 | 8568 | 8582 | 8596 | 861 | 862 | 363 | 865 | 66 |  |
|  | 91 | 9116 | 9113 | 9110 | 9107 | 9104 | 9101 | 9098 | 9095 | 5.9091 | 1.0247 | 0264 | 0281 | 0299 | 03 | 033 | 0350 | 0367 | 0385 | 0402 |  |
|  | 8972 | 896 | 8965 | 89 | 89 |  |  |  | 894 | 6.89 |  | 197 |  |  | 2035 | 20 | 2075 |  | 21 | 2135 |  |
|  | 882 |  | 8817 | 3 |  |  |  |  |  | $7 \cdot 87$ |  | 368 |  |  |  | 3777 |  | 38 | 384 | 8860 |  |
|  | 8678 | 8673 | 869 | 8664 | 8660 | 86 |  |  |  |  |  | 539 | 54 | 5448 | 5474 | 5499 | 5525 | 5 | 557 | 5603 |  |
| 10 | 853 |  | 8521 | 85 |  | 8506 |  |  |  | 983 |  | 7107 | 71 | 164 | 7193 | 7222 | 7250 | 7279 | 7308 | 7336 | 10 |
| 11 | 83 | 8378 | 8373 |  |  |  |  |  | 8340 | 10.833 | 1.8786 | 8818 | 884 | 8881 | 8912 | 8944 | 8975 | 9007 | 9038 | 9070 |  |
| 1 | 823 | 82 | 8225 | 8219 | 82 | 82 |  |  | 8189 | 11.81 |  | 0528 | 056 | 0597 |  | 0666 | 0700 | 07 | 0769 | 0803 | 12 |
| 13 | 809 | 8084 | 8077 | 807 |  | 80 |  | 8045 | 8883 | 12. | 22 | 223 | 227 | 23 | 2351 | 238 | 242 | 246 | 25 | 2537 | 13 |
|  | 794 |  |  | 792 |  | 7908 |  |  | 788 | $13 \cdot 78$ | ． 3910 | 39 | 3990 |  | 40 | 41 | 4150 | 4190 | 4231 | 427 | 1 |
| 15 | 779 | 7789 | 7781 | 7774 | 7766 | 77 | 77 | 7744 | 36 | 14.772 | 2.5617 | 5660 | 570 | 6 | 5789 | 583 | 587 | 59 | 596 | 600 | 15 |
| 16 | 76 | 7641 | 7633 | 7625 | 7617 | 7609 | 7601 | 粏 | 7585 | 15 | $2 \cdot 7325$ | 7371 | 7417 | 7463 | 7509 | 7554 | 760 | 7646 | 7692 | 7738 | 16 |
| 17 | 75 |  |  |  |  | 7460 |  |  |  | 16.74 | 咗 | 9082 |  |  | 9228 | 9277 | 93 | 9374 | 942 | 9471 |  |
| 18 | 735 | 73 | 7338 | 7329 | 73 | 73 | 7302 | 7293 | 84 | 17. | 3.0741 | 0792 | 08 | 0896 | 0947 | 09 | 105 | 110 | 1154 | 120 | 18 |
| 19 | 720 |  |  | 7180 |  |  |  |  | 7133 | 18 | 3.2449 | 250 | 25 | 26 | 26 | 272 | 275 | 28 | 288 | 293 | 19 |
| 20 | 7062 |  |  |  |  |  |  |  | 8132 |  |  | 421 |  | 4329 | 4386 | 44 | 550 | 45 | 46 | 467 | 20 |
| 21 | 69 | 6904 |  |  | 6873 | 6862 |  |  | 6831 | $20^{\circ} 6$ | $3 \cdot 5864$ | 592 |  | 6045 | 6105 | 6165 | 6225 |  |  |  |  |
| 2 | 676 | 67 | 67 | 67 | 6724 | 67 |  |  |  |  |  | 763 |  |  |  | 7887 | 7950 | 801 |  | 8140 | 22 |
| 23 | 662 | 66 | 65 | 6587 | 6575 | 65 |  | 6541 | 6529 | $22 \cdot 6517$ | 3.9280 | 9346 | 94 | 9478 | 9544 | 9610 | 967 | 97 |  | 987 | 23 |
| 2 | 647 | 64 | 64 | 6438 | 6426 | 64 | 640 | 6390 | 6378 | 23.6 | 4.0988 | 105 | 112 | 11 | 63 | 1332 | 140 | 146 | 153 | 160 | 24 |
| 25 | 632 | 6315 |  | 6290 | 6277 | 62 | 6252 |  | 6227 | 24.621 | 4.2696 | 276 | 28 | 29 | 2982 | 30 | 312 | 319 | 326 | 334 | 25 |
| 26 | 61 | 6167 | 6154 | 6141 | 6128 | 6115 | 6102 |  | 6076 | 25.606 | 4.4404 | 4478 | 455 | 4627 | 4702 | 4776 | 485 | 492 | 5000 | 507 | 26 |
|  | 603 |  |  |  |  |  |  |  | 5925 | $26 \cdot 59$ |  | 618 |  |  |  |  |  |  |  | 88 |  |
| 28 | 588 | 58 | 58 | 5845 | 58 | 5817 | 5803 | 5788 | 57 | 27. | 4781 | 789 | 798 | 80 | 8140 | 822 | 830 | 838 | 846 | 854 | 28 |
| 29 | 57 |  |  | 5696 | 5682 |  |  | 5638 | 5623 | 28. | 4.95 | 961 | 96 | 97 | 9859 | 994 | ＋02 | 0109 | 0192 | 027 | 29 |
| 30 | 559 | 57 |  |  | 5533 | 5518 |  |  | 5473 | 9 | 5123 | 1321 | 140 | 149 | 1579 | 166 | 175 | 183 | 192 | 200 | 30 |
| 31 | 544 | 54 | 54 |  | 5384 | 5368 |  |  | 5322 | 30．530 | 5.2943 | 3032 |  | 3209 | 329 | 338 |  |  |  |  |  |
| 32 | 52 | 528 | 5267 |  |  | 521 |  |  |  | 31 |  | 474 | 483 |  | 5017 | 510 | 520 | 529 | 538 | 547 | 32 |
| 33 | 5152 |  |  | 5103 | 5086 |  |  |  | 5020 | $32 \cdot 50$ |  | 645 |  | 6642 | 67 | 683 | 69 | 7020 |  | 720 |  |
| 34 | 5005 | 4988 | 4971 | 4954 | 4937 | 492 | 49 | 48 | 48 | 33 | 5.806 | 81 | 82 | 83 | 84 | 85 | 865 | 87 | 884 | 894 | 34 |
| 35 | 4858 | 484 | 482 | 4806 | 4788 | 4771 | 47 | 47 | 4718 | 34 | ．97 | 987 | 997 | ＋0 | 01 | 027 | 037 | 047 | 057 | 0677 | 35 |
| 36 | 4711 | 4693 | 4675 | 4657 | 4639 | 462 |  |  | 456 | $35 * 454$ | 6.1482 | 1585 | 1688 |  |  | 1998 | 2101 | 2204 | 2307 | 2410 | 36 |
| 37 | 4564 | 45 | 452 |  | 4490 | 4472 |  |  | 441 | 36 |  | 329 | 340 |  |  | 372 |  |  |  |  |  |
| 38 | 4417 | 439 | 437 | 436 | 4342 | 43 | 4303 | 4284 | 426 | 37. |  | 500 | 511 | 52 | 5333 | 54 | 555 | 566 | 576 | 587 | 38 |
| 39 | 42 |  | 42 | 4212 | 41 | 4173 |  |  | 4114 | 38．409 | $6 \cdot 66$ | 671 | 68 | 69 | 70 | 716 | 727 | 738 | 749 | 761 | 39 |
| 40 | 412 |  |  |  |  | 4024 |  |  |  | 39．3943 |  | 8428 | 8542 |  |  | 888 | 000 | 11 | 923 | 934 | 40 |
| 41 | 397 | 395 | 3936 |  |  | 3874 |  |  | 3813 | $40^{\circ}$ | $7 \cdot 002$ | 0138 |  |  |  | 060 | 0726 |  |  |  |  |
| 42 | 38 | 3809 | 3788 |  | 3746 | 3725 |  |  |  |  |  |  |  |  |  |  |  |  |  | 281 | 42 |
| 43 | 368 | 366 |  | 3618 | 359 | 3575 |  |  |  | 42 | 7.34 | 35 |  |  |  | 405 | 417 | 429 |  | 454 |  |
| 44 | 353 | 35 |  | 34 | 3448 | 3426 | 34 |  | 3360 |  |  | 527 |  |  |  | 577 | 590 | 602 | 615 | 627 |  |
| 45 | 338 | 33 | 334 | 33 | 3 | 3277 | 32 | 3232 | 3209 | 44 | 7.6852 | 698 |  | 72 | 7368 | 74 | 76 | 77 | 78 | 801 | 45 |
| 46 | 3242 | 3219 |  |  |  | 312 |  |  |  | $45 \cdot 30$ |  | 869 |  |  |  | 2219 | 9351 |  |  |  |  |
| 47 | 309 | 307 | 30 |  | 300 | 2978 |  |  |  | 46.288 | 2068 | 040 | 053 |  |  |  | 107 |  |  |  |  |
| 48 | 29 | 292 |  |  |  | 282 | 2804 |  |  | 47 |  | 211 | 225 |  |  |  | 280 | 293 |  |  | 48 |
| 49 | 280 | 2777 |  |  |  |  |  |  |  | 48.258 | $8 \cdot 36$ | 3824 | 39 |  | 42 | 43 | 45 |  | 4807 | 494 | 9 |
| 50 | 2654 | 263 | 2605 | 2580 | 2555 | 2530 | 2505 | 2479 | 2454 | 49.2429 | $8 \cdot 539$ | 553 | 567 | 58 | 59 | 610 | 625 | 639 | 6538 | 6681 | 50 |
| 51 | 250 |  |  |  |  | 2380 |  |  |  |  |  | 724 | 73 |  |  | 78 |  |  |  |  | 51 |
| 52 | 236 | 233 | 230 | 2283 |  | 2231 |  |  |  | 51.21 |  | 995 | 910 |  |  |  |  |  |  |  | 52 |
| 53 | 221 | 2187 | 21 | 21 | 21 | 208 | 205 | 2028 | 2002 | 52 | $9 \cdot 05$ | 066 | 081 |  | 1122 | 127 | 142 | 157 | 173 |  |  |
| 54 | 2067 | 2040 | 20 |  |  |  | 19 |  |  |  |  |  | 25 |  |  |  |  | 3306 | 346 |  | 54 |
| 55 | 19 | 1892 | 1865 | 1838 | 1810 | 1783 | 1755 | 1727 | 1700 | 54．1672 | 9.3931 | 4088 | 42 | 4403 | 45 | 47 | 487 | 50 | 51 |  | 55 |
| 56 | 1773 | 1745 |  |  | 166 | 1633 | 160 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 16 | 15 | 156 | 15 | 15 | 1484 | 145 | 1427 | 13 | 56.1 | 9.73 | 7510 | 767 |  | 8000 | 816 | 832 |  |  |  |  |
| 58 | 147 |  |  |  |  | 1334 |  |  |  | 57．121 | 90 | 9220 | 938 |  | 97 |  |  | 02 |  |  | 58 |
| 59 | 1332 | 303 | 273 | 1244 | 121 | 1185 | 155 | 26 | 1096 | 58.106 | 10.07 | 093 | 110 |  |  |  | 1776 |  |  |  | 9 |
| 60 | 118 | 1155 | 1126 | 1096 | 106 | 1036 | 1005 | 0975 | 09 | 59.0915 | 10.24 | 264 | 28 | 298 | 315 | 332 | 350 | 367 | 384 | 401 | 60 |
| 61 | 103 |  |  |  |  |  |  |  |  |  | $10 \cdot 41$ |  | 45 |  |  | 505 | 5281 |  |  |  |  |
| 62 |  |  |  |  |  |  |  |  |  | O6 |  |  |  |  | 659 |  |  |  |  |  |  |
| 63 | 074 | 0713 | 06 | 065 | 061 | 0587 | 0556 | 05 | 0492 | 62. | 10.75 | 77 | 795 |  | 831 | 84 | 867 | 88 |  |  | 63 |
| 64 | 05 |  |  |  |  |  | 04 |  | 0342 |  | 10 | 948 | 96 |  |  | 02 | 040 | 058 |  |  | 64 |
| 65 | 04 |  |  |  |  |  |  |  |  | 64 | 11 |  | 138 |  |  |  | 2126 | 23 |  |  | 65 |
| 66 | 03 | 0271 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 015 | 01 |  | 00 |  |  |  |  | 9889 | 65.985 | 11.44 | 46 | 480 |  |  |  |  |  |  |  | 67 |
| 68 |  |  |  |  |  |  |  |  |  |  |  |  | 65 |  | 912 |  |  |  |  |  | 68 |
| 69 | 9863 | 9829 | 9794 | 9760 | 97 | 9691 | 65 | 9622 | 9587 | 67 | 11.7 | 80 | 82 | 8433 | 86 | 882 | 902 | 922 | 942 |  | 69 |
| 70 | 9716 | 9681 | 9646 | 9612 | 9577 | 9542 | 9506 | 9471 | 9436 | 68.9401 | 11 | 9749 | 9949 | ＋150 | 0350 | 05 | 075 | 295 | 1153 | 135 | 70 |
| 71 | 95 | 9534 |  |  |  |  | 9356 |  |  | 929 |  | 14 |  |  |  |  |  |  |  |  | 7 |
| 72 | 94 |  |  |  |  |  |  |  |  |  |  |  |  | 矿 |  |  |  |  |  |  | 72 |
| 73 | 9275 | 923 | 920 | 91 | 9130 | 9093 | 9057 | 9020 | 8983 | 71.894 | 12.46 | 488 | 509 | 529 | 550 | 571 | 592 | 613 | 63 | 655 | 73 |
| 74 | 9128 |  |  |  |  |  | 㖪 | 8870 | 883 | －979 |  | 659 | 680 | 7015 | 722 | 744 | 7652 | 786 | 807 | 82 | 74 |
| 75 | 8982 | 8944 | 8907 | 8869 | 8832 | 87 | 8757 |  |  | 73.864 | 12.80 |  | 85 |  |  |  | 9377 |  |  |  | 75 |
| 76 | 8835 | 8797 | 8759 |  |  | 8645 | 860 | 8 |  |  |  |  | 02 |  |  | ， |  |  |  |  | 76 |
| 77 | 86 | 864 | 8611 | 85 | 85 | 84 | 845 | 8418 | 8380 | 75.834 | $13 \cdot 150$ | 172 | 194 | 216 | 238 | 2606 | 282 | 304 | 32 | 34 | 77 |
| 78 | 8541 | 8502 |  |  |  |  | 1575 |  | 8229 | $76 \cdot 818$ | 13.3211 |  | 365 | 5881 | 4105 | 4328 | 455 | 55 | 672 |  | 78 |
| 79 | 8394 | 8355 | 8315 | 82 | 82 | 8197 | 8157 | 8118 | 8078 | 77－803 | 13.491 | 514 | 537 | 5598 | 582 | 6050 | 627 | 6503 | 672 | 698 | 79 |
| 80 | 82 | 8207 | 8167 | 8127 | 8087 | 8047 | 8007 | 7967 | 7927 | 78.788 | 13 | 685 | 708 | 731 | 754 | 777 | 800 | 82 | 84 | 86 | 80 |
| 81 |  |  |  |  |  |  |  | 矿 | 7776 |  |  | 8566 | 879 | 903 |  | 9495 | 972 | 矿 |  |  | 81 |
| 82 | 7953 | 7912 |  | 7831 |  |  | 75 | 765 | 762 | 80.75 |  |  | 051 | 074 |  | 12939 | 1452 | 梼 |  |  | 82 |
| 83 | 7806 | 77 | 77 | 768 | 7641 | 75 | 7558 | 7516 | 7474 | 81.743 | 14.1750 | 198 | 22 | 2463 | 270 | 293 | 317 | 341 | 365 | 389 | 83 |
| 84 | 7659 | 77618 |  |  |  |  | 7408 | 源 | 7323 | $82 \cdot 728$ |  | 369 |  | 418 | 442 | 466 | 492 | 5143 | 538 |  | 84 |
| 85 | 7512 | 7470 | 428 | 7385 | 734 | 7300 | 7258 | 215 | 7172 | 83.712 |  |  |  |  |  |  |  |  |  |  | 85 |
| 86 | 7365 | 7323 | 7280 | 7237 | 719 | 7151 | 7108 | 7065 | 7021 | 84．697 | 14 | 712 | 736 | 7613 | 859 | ， | 835 | 858 |  |  | 86 |
| 87 | 7219 | 7175 | 7132 | 6910 |  | 7002 | 6958 | 6914 | 6870 | 85.682 | 14.858 | 883 | 908 | 932 | 957 | 982 | ＋07 | 032 | 057 | 08 | 87 |
| 88 | 7072 | 7028 | 6984 | 6940 | 68 | 6852 | 6858 | 6764 | 672 | $86 \cdot 667$ | 15 | 054 | 0793 | 104 | 129 | 155 | 180 | 205 | 230 |  | 88 |
| 89 | 6925 | 6881 | 6836 |  |  | 6703 | 6658 | 6613 | 6569 | $87 \cdot 6524$ | 15．1997 | 2252 | 2507 | 2762 | 301 | 327 | 352 | 378 | 4037 | 42 | 89 |
| 90 | 6778 | 6733 | 6 | 6643 | 6598 | 6553 | 6508 | 6463 | 6418 | $88^{\circ} 6372$ | 15.3705 | 3962 | 422 | 447 | 473 | 499 | 525 | 55 | 57 | 602 | 90 |
| 91 | 6631 | 6586 | 654 |  |  |  |  |  | 267 |  |  |  |  |  |  |  | 6977 | 723 |  |  |  |
| 92 | 6484 | 6438 | 639 | 634 | 630 | 6255 | 6208 | 6162 | 6116 | 90.607 | 15.7120 | 7384 | 764 | 791 | 8175 | 843 | 8702 | 896 | 92 |  | 92 |
| 93 | 6337 | 6291 | 6245 | 6198 | 6152 | 6105 | 6058 | 6012 | 5965 | 91．591 | 15.8828 | 905 | 936 | 962 | 989 | －16 | 042 | 069 | 09 | 122 | 93 |
| 94 | 6190 | 6143 | 6097 | 6050 | 6003 | 5956 | 590 | 5861 | 5814 | 92576 | 0536 | 2805 | 1075 | 134 | 1613 | 188 | 275 | 2 | 269 | 296 | 94 |
| 95 | 60 | 5996 | 5949 | 5901 | 5854 | 5806 | 5759 | 5711 | 5663 | 93.5615 | 16.2244 | 2516 | 2788 | 306 | 3333 | 3605 | 387 | 414 | 442 | 469 | 95 |
| 96 | 5896 | 5849 |  |  |  | 5657 | 5609 | 5561 | 5512 | 94．546 | 16．3951 | 422 | 4502 | 477 | 5052 | 5327 | 560 | 587 | 615 |  | 96 |
| 97 | 57 | 570 | 56 | 56 | 540 | 5508 | 5459 | 5410 | 5361 | $95 \cdot 531$ | 16.565 | 5937 | 6215 | 6493 | 6771 | 7049 | 732 | 760 | 7883 | 816 | 97 |
| 98 | 5603 | 5554 | 5505 | 5456 | 540 | 5358 | 5309 | 5260 | 5210 | $96 \cdot 516$ | 16.7367 | 7648 | 7929 | 8210 | 8491 | 877 | 975 | 93 | ， | 9894 | 98 |
| 100 | 5456 | 5259 | 5209 | 5308 | 5258 | 5209 | 5159 | 5109 | 5060 | $97 \cdot 501$ | 16.9075 | 9359 | 9642 | 9926 | ＋210 | 0493 | 0777 | 10 | 134 | 162 | 99 |
| 100 | 5309 | 5259 | 5209 | 5159 | 5109 | 5059 | 509 | 4959 | 09 | 48 | 17．078 | 1069 | 1356 | 1643 | 92 | 2216 | 2502 | 2789 | 307 | 362 |  |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2{ }^{\prime}$ |  |  |  |  |  |  |  |  |  |  |  |  |
| 80 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


# TRAVERSE TABLES. 



TRAVERSE TABLES．

| $10^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $10^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | 21 | 22 | 23 | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 | 28 | $29^{\prime}$ | $20^{\prime}$ | 21 | 22 | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | $27^{\prime}$ | $28^{\prime}$ |  |  |
|  | 983 | 9837 | 9837 | 9836 | 9836 | 9835 | 9835 | 9834 | 9834 | ．9833 | 1794 | 1797 | 1799 | 1802 | 1805 | 1808 | 1811 | 1814 | 1817 | 1819 |  |
|  | 9676 | 9675 | 9674 | 9672 | 9671 | 9670 | 9669 | 9668 | 9667 | $1 \cdot 9666$ | －3587 | 3593 | 3599 | 3605 | 3610 | 3616 | 3622 | 3628 | 3633 | 3639 |  |
|  | 9513 | 9512 | 9510 | 9509 | 9507 | 9506 | 9504 | 9502 | 9501 | 2.9499 | 5381 | 5390 | 5398 | 5407 | 5416 | 5424 | 5433 | 5441 | 50 | 5458 |  |
|  | 9351 | 9349 | 9347 | 9345 | 9343 | 9341 | 9339 | 9337 | 9334 | 3.9332 | 7175 | 7186 | 7198 | 7209 | 7221 | 7232 | 7244 | 7255 | 67 | 7278 |  |
| 5 | 9189 | 9186 | 9184 | 9181 | 9179 | 9176 | 917 | 171 | 9168 | 4.9165 | －969 | 8983 | 8997 | 9012 | 9026 | 04 | 905 | 069 | 9083 | 909 |  |
|  | 9027 | 9024 | 9021 | 9017 | 9014 | 9011 | 900 | 9005 | 002 | 5 | 1.076 | 07 | 07 | 0814 | 08 | 08 | 08 | 08 | 0900 | 0917 |  |
|  | 8865 | 8861 | 8857 | 8854 | 8850 | 8846 | 8843 | 8839 | 8835 | 6．8832 | $1 \cdot 2556$ | 2576 | 2596 | 2616 | 263 | 2656 | 2676 | 2696 | 2716 | 2736 |  |
|  | 8702 | 8698 | 8694 | 8690 | 8686 | 8682 | 8677 | 8673 | 8669 | 7．8665 | $1 \cdot 4350$ | 4373 | 4396 | 4419 | 4442 | 4464 | 4487 | 4510 | 4533 | 4556 | 8 |
|  | 8540 | 8536 | 8531 | 8526 | 8521 | 8517 | 8512 | 8507 | 8502 | 8．8498 | $1 \cdot 6144$ | 6169 | 6195 | 6221 | 6247 | 6272 | 6298 | 6324 | 6350 | 637 |  |
| 10 | 8378 | 8373 | 8368 | 8362 | 835 | 8352 | 8347 | 8341 | 8336 | 9.8331 | $1 \cdot 7937$ | 7966 | 7995 | 8023 | 8052 | 8081 | 8109 | 8138 | 8166 | 8195 | 10 |
| 11 | 8216 | 8210 | 8204 | 8199 | 8193 | 8187 | 8181 | 8175 | 8170 | 10.8164 | 1.9731 | 9763 | 9794 | 9826 | 9857 | 9889 | 9920 | 9952 | 9983 | ． 014 | 11 |
| 12 | 8054 | 804 | 8041 | 8035 | 8029 | 8022 | 8016 | 8010 | 8003 | 11 －7997 | $2 \cdot 1525$ | 1559 | 1594 | 1628 | 1662 | 1697 | 1731 | 1765 | 1800 | 1834 | 12 |
| 13 | 7892 | 7885 | 7878 | 7871 | 7864 | 7857 | 7851 | 7844 | 7837 | 12.7830 | 2.3319 | 3356 | 3393 | 3430 | 3467 | 3505 | 3542 | 3579 | 361 | 3653 | 13 |
| 14 | 7729 | 7722 | 7715 | 7707 | 7700 | 7693 | 7685 | 7678 | 7671 | 13.7663 | 2.5112 | 5152 | 5193 | 5233 | 5273 | 5313 | 5353 | 5393 | 5433 | 5473 | 14 |
| 15 | 756 | 755 | 7551 | 44 | 36 | 752 | 7520 | 7512 | 7504 | 147496 |  | 6949 | 6992 | 7035 | 7078 | 7121 | 716 | 720 | 7250 | 729 | 15 |
| 16 | 740 | 739 | 738 | 738 | 7371 | 736 | 7355 | 7346 | 338 | 15 | 870 | 8746 | 8792 | 88 | 8883 | 89 | 8975 | 9020 | 9066 | 9112 | 16 |
| 17 | 7243 | 7234 | 7225 | 7216 | 7207 | 7198 | 7189 | 7180 | 7171 | $16 \cdot 7162$ | 3.0494 | 0542 | 0591 | 0640 | 0688 | 0737 | 0786 | 0834 | 0883 | 09 | 17 |
| 18 | 7081 | 707 | 7062 | 7052 | 7043 | 7033 | 7024 | 7014 | 7005 | 17.6995 | 3.2287 | 2339 | 2390 | 2442 | 2493 | 2545 | 2596 | 2648 | 2699 | 275 | 18 |
| 19 | 6918 | 6908 | 6898 | 6889 | 6879 | 6869 | 6859 | 6849 | 6839 | $18^{\circ} 6829$ | 4081 | 4136 | 4190 | 4244 | 4299 | 4353 | 4407 | 4462 | 4516 | 4570 | 19 |
| 20 | 6756 | 6746 | 6735 | 6725 | 6714 | 6704 | 6693 | 6683 | 6672 | 19.6662 | 3.5875 | 5932 | 5989 | 6047 | 6104 | 6161 | 6218 | 6275 | 6333 | 6390 | 20 |
| 21 | 6594 | 658 | 65 | 656 | 6550 | 653 | 6528 | 6517 | 6506 | 20.6495 | 3.766 | 7729 | 778 | 7849 | 7909 | 796 | 802 | 8089 | 814 | 8209 | 21 |
| 22 | 6432 | 6420 | 6409 | 6397 | 6386 | 6374 | 6363 | 6351 | 6339 | 21.6328 | 3.9462 | 9525 | 9588 | 9651 | 9714 | 9777 | 9840 | 9903 | 996 | ＋020 | 22 |
| 23 | 6270 | 6258 | 6246 | 6233 | 6221 | 6209 | 6197 | 6185 | 6173 | 22.6161 | $4 \cdot 1256$ | 1322 | 1388 | 1454 | 1519 | 1585 | 1651 | 1717 | 1783 | 18 | 23 |
| 24 | 6107 | 6095 | 6082 | 6070 | 6057 | 6045 | 6032 | 6019 | 6007 | 23.5994 | 4.3050 | 3119 | 3187 | 3256 | 3325 | 3393 | 3462 | 3531 | 3599 | 36 | 24 |
| 25 | 5945 | 5932 | 5919 | 5906 | 5893 | 5880 | 367 | 5853 | 5840 | 24.5827 | 4．4844 | 4915 | 4987 | 5058 | 5130 | 520 | 52 | 5344 | 541 | 5487 | 25 |
| 26 | 5783 | 576 | 575 | 5742 | 5729 | 5715 | 570 | 5688 | 5674 | $25^{\circ}$ | ＇6637 | 6712 | 67 | 6861 | 6935 | 7009 | 7084 | 588 | 7233 | 730 | 26 |
| 27 | 5621 | 5607 | 559 | 5578 | 5564 | 5550 | 5536 | 5522 | 5507 | $26 \cdot 54$ | 4.8431 | 8508 | 8586 | 8663 | 8740 | 8817 | 8895 | 8972 | 9049 | 91 | 27 |
| 28 | 5459 | 544 | 5429 | 5415 | 5400 | 5385 | 5371 | 5356 | 5341 | $27 \cdot 5326$ | 5.0225 | 0305 | 0385 | 0465 | 0545 | 0625 | 0706 | 0786 | 0866 | 09 | 28 |
| 29 | 5296 | 528 | 5266 | 5251 | 5236 | 5220 | 5205 | 5190 | 5175 | 28.5159 | 5.2019 | 2102 | 2185 | 2268 | 2351 | 2434 | 2516 | 259 | 2682 | 276 | 29 |
| 30 | 5134 | 5119 | 5103 | 5087 | 5071 | 5056 | 5040 | 5024 | 5008 | 29－4992 | 5.3812 | 3898 | 3984 | 4070 | 4156 | 424 | 4327 | 4413 | 449 | 4585 | 30 |
| 3 | 4972 | 4956 | 494 | 4923 | 4907 | 489 | 487 | 4858 | 484 | $30^{\circ}$ | $5 \cdot 5$ | 5695 | 5784 | 5872 | 59 | 60 | 6138 | 6227 | 6316 | 6404 | 31 |
|  | 4810 | 4793 | 4776 | 4760 | 4743 | 4726 | 4709 | 4692 | 4675 | 31－465 | 57400 | 7491 | 7583 | 7675 | 7766 | 78 | 7949 | 804 | 813 | 82 | 32 |
| 33 | 4648 | 4630 | 4613 | 4596 | 4579 | 4561 | 4544 | 4526 | 4509 | 32．449 | $5 \cdot 919$ | 9288 | 9382 | 9477 | 9571 | ． 9666 | 9760 | 985 | 994 | －0 | 33 |
| 34 | 4485 | 4468 | 4450 | 4432 | 4414 | 4396 | 4379 | 4361 | 4343 | $33 \cdot 432$ | ． 098 | 1085 | 1182 | 127 | 1376 | 147 | 1571 | 1668 | 176 | 186 | 34 |
| 35 | 4323 | 4305 | 4287 | 4268 | 4250 | 4232 | 4213 | 95 | 4176 | 34：4158 | 6.278 | 288 | 2981 | 308 | 3182 | 328 | 3382 | 3482 | 3582 | 3682 | 35 |
| 36 | 4161 | 4142 | 4123 | 4105 | 4086 | 406 | 4048 | 4029 | 4010 | 35 | 6.4575 | 4678 | 478 | 4884 | 4987 | 0 | 51 | 5296 | 5399 | 55 | 36 |
| 37 | 3999 | 398 | 3960 | 3941 | 3921 | 3902 | 388 | 3863 | 3843 | 36．3824 | 63 | 6474 | 6580 | 6686 | 6792 | 6898 | 7004 |  | 721 | 73 | 37 |
| 38 | 3837 | 3817 | 3797 | 3777 | 3757 | 3737 | 3717 | 3697 | 3677 | 37－3657 | 6.816 | 8271 | 8380 | 8489 | 8597 | 8706 | 8815 | 8923 | 903 | 91 | 38 |
| 39 | 3675 | 3654 | 3634 | 3613 | 3593 | 3572 | 3552 | 3531 | 3511 | 38．3490 | 6.9956 | 1068 | 0179 | 0291 | 0402 | 0514 | 062 | 073 | 084 | 仡 | 38 |
| 40 | 3512 | 3491 | 3471 | 3450 | 3429 | 3408 | 3387 | 3365 | 3344 | 39．3323 | 7－1750 | 1864 | 1979 | 2093 | 2208 | 2322 | 2437 | 255 | 2665 | 278 | 40 |
| 41 | 33 | 3329 | 33 | 3286 | 3264 | 3243 | 322 | 200 | 317 | 40 | 7.3544 | 36 | 37 | 38 | 4013 | 41 | 42 | 4365 | 4482 |  | 41 |
| 42 | 318 | 3166 | 3144 | 3122 | 3100 | 3078 | 3056 | 3034 | 3012 | 41.298 | 7.5337 | 5457 | 5578 | 5698 | 5818 | 5938 | 6058 | 6179 | 629 | 6419 | 42 |
| 43 | 3026 | 3003 | 2981 | 2958 | 2936 | 2913 | 2891 | 2868 | 2845 | 42.2822 | 7.7131 | 7254 | 7377 | 7500 | 7623 | 7746 | 7869 | 7992 | 811 | 82 | 43 |
| 44 | 2864 | 28 | 2818 | 2795 | 2771 | 27 | 2725 | 2702 | 2679 | 43.2655 | 925 | 905 | 9177 | 930 | 9428 | 955 | 9680 | 980 | 993 | ${ }^{0}$ | 44 |
| 45 | 27 | 2678 | 2654 | 2631 | 2607 | 2584 | 2560 | 2536 | 2512 | 44．2489 | 8.0719 | 0847 | 09 | 110 | 1234 | 13 | 1491 | 1620 | 174 | 18 | 45 |
| 46 | 2539 | 2515 | 24 | 2467 | 2443 | 2419 | 23 | 2370 | 2346 | $45^{\circ} 2322$ | 8.2512 | 2644 | 2776 | 90 | 3039 | 31 | 3302 | 34 | 3565 | 3697 | 46 |
| 47 | 2377 | 2352 | 2328 | 2303 | 2279 | 2254 | 2229 | 2204 | 2180 | $46 \cdot 2155$ | 8.4306 | 4441 | 4575 | 4710 | 4844 | 4978 | 5113 | 5247 | 5382 | 551 | 47 |
| 48 | 2215 | 2190 | 2165 | 2139 | 2114 | 2089 | 2064 | 2039 | 2013 | $47 \cdot 1988$ | 8.61 | 6237 | 6375 | 6512 | 6649 | 6786 | 6924 | 7061 | 719 |  | 48 |
| 49 | 2053 | 2027 | 2001 | 1976 | 1950 | 1924 | 1898 | 1873 | 1847 | $48 \cdot 1821$ | 39 | 8034 | 8174 | 8314 | 8454 | 8595 | 8735 | 8875 | 9015 | 915 | 49 |
| 50 | 1890 | 1864 | 1838 | 1812 | 1786 | 1759 | 1733 | 1707 | 1680 | 49•1654 | 9687 | 830 | 9973 | ＋117 | 026 | 0403 | 0546 | 068 | 0832 | 0975 | 50 |
| 51 | 172 | 1702 | 1675 | 1648 | 1621 | 1595 | 1568 | 1541 | 1514 | 50．148 | 9．1481 | 1627 | 1773 | 1919 | 206 | 2211 | 2357 | 2502 | 2648 |  | 51 |
| 52 | 1566 | 1539 | 1512 | 1484 | 1457 | 1430 | 1402 | 1375 | 1348 | $51 \cdot 132$ | 9.3275 | 3424 | 3572 | 3721 | 3870 | 4019 | 4167 | 4316 | 4465 | 46 | 52 |
| 53 | 1404 | 1376 | 1348 | 1321 | 1293 | 1265 | 1237 | 1209 | 1181 | 52.115 | 506 | 5220 | 5372 | 5523 | 5675 | 5827 | 5978 | 613 | 628 | 643 | 53 |
| 54 | 1242 | 1213 | 1185 | 1157 | 11 |  | 1072 | 1043 | 1015 | 53.09 | 6862 | 701 | 71 | 7326 | 748 | 76 | 7789 | 794 | 808 |  | 54 |
| 55 | 1079 | 10 | 10 | 0993 | 0964 | 0935 | 0906 | 7 | 0848 | 54．0819 | 9.8656 | 8813 | 8971 | 9128 | 928 | 94 | 96 | 9758 | 991 | 10 | 55 |
| 56 | 0917 | 0888 | 0859 | 0829 | 0800 |  | 074 | 0712 | 682 | 55.065 | 10. | 0 | 0770 | 0930 | 1091 | 1251 |  | 1571 | 32 | 1892 | 56 |
| 57 | 0755 | 0725 | 0695 | 0666 | 0636 | 0606 | 0576 | 0546 | 0516 | 56.0486 | 10.2244 | 2407 | 2570 | 2733 | 2896 | 3059 | 3222 | 3385 | 3548 | 3711 | 57 |
| 58 | 0593 | 0563 | 0532 | 0502 | 0471 | 0441 | 0410 | 0380 | 0349 | 57.0319 | 10.4037 | 4203 | 4369 | 4535 | 4701 | 4867 | 5033 | 5199 | 5365 | 553 | 58 |
| 59 | 0431 | 0400 | 0369 | 0338 | 0307 | 0276 | 0245 | 0214 | 0183 | 58.0152 | 10.5831 | 6000 | 6169 | 6337 | 6506 | 6675 | 6844 | 7013 | 7181 |  | 59 |
| 60 | 0268 | 0237 | 0206 | 0174 | 143 | 0111 | 0080 | 0048 | ＋016 | 58．9985 | 10.7625 | 7796 | 7968 | 8140 | 831 | 848 | 8655 | 8826 | 8998 | 9170 | 60 |
| 61 | 0106 | 0074 | 0043 | ＊011 | 9979 | 9947 | 9914 | 9882 | 9850 | 59．9818 | 10．9419 | 9593 | 9768 | 1942 | －117 | 0291 | 0466 | 0640 | 0815 | 098 | 61 |
| 62 | 9944 | 9912 | 9879 | 9847 | 9814 | 9782 | 9749 | 9716 | 9684 | 60.9651 | $11 \cdot 1212$ | 1390 | 156 | 1744 | 1922 | 209 | 2277 | 2454 | 2631 | 2809 | 62 |
| 63 | 9782 | 97 | 9716 | 9683 | 9650 | 9617 | 9584 | 9551 | 9517 | 61.9484 | 11.3006 | 3186 | 3367 | 3547 | 3727 | 3907 | 4088 | 4268 | 4448 | 4628 | 63 |
| 64 | 9620 | 958 | 9553 | 9519 | 9486 | 9452 | 94 | 9385 | 9351 | 62.9317 | 11.4800 | 4983 | 5166 | 5349 | 5532 | 5715 | 58 | 6082 | 6265 | 64 | 64 |
| 65 | 9458 | 9424 | 9390 | 9356 | 9321 | 9287 | 9253 | 9219 | 9185 | 63.9150 | 11.6593 | 6779 | 6965 | 7151 | 7337 | 7523 | 7709 | 7895 | 805 | 826 | 65 |
| 66 | 9295 | 926 | 92 | 92 | 9157 | 91 | 9088 |  | 9018 | 64•8983 | 11.8387 | 8576 |  |  | 9143 | 933 |  |  | 9898 |  | 66 |
| 67 | 9133 | 9098 | 9063 | 9028 | 8993 | 8958 | 8922 | 8887 | 8852 | 65.8816 | 12.0181 | 0373 | 0564 | 0756 | 0948 | 1139 | 1331 | 1523 | 1715 | 1906 | 67 |
| 68 | 8971 | 893 | 890 | 88 | 8829 | 87 | 8757 | 8721 | 8685 | 66.8649 | 12．1975 | 2169 | 2364 | 2558 | 2753 | 2948 | 3142 | 3337 | 3531 | 572 | 68 |
| 69 | 8809 | 8773 | 8737 | 8700 | 8664 |  | 8592 | 8555 | 8519 | 67•8482 | 12．3768 | 576 | 4163 | 4361 | 4558 | 4756 | 4 | 515 | 534 |  | 69 |
| 70 | 8647 | 8610 | 8573 | 8537 | 8500 | 846 | 8426 | 8390 | 835 | 68．8316 | 12.5562 | 5762 | 596 | 616 | 6363 | 656 | 676 | 696 | 716 | 736 | 70 |
| 71 | 8484 | 8447 | 8410 | 8373 | 8336 | 8298 | 8261 | 8224 | 8186 | 69．8149 | 127356 | 7559 | 7762 | 7965 | 8169 | 8372 | 8575 | 8778 | 8981 | 918 |  |
| 72 | 8322 | 8285 | 8247 | 8209 | 8171 | 8134 | 8096 | 8058 | 8020 | 70.7982 | 12.9150 | 9356 | 9562 | 9768 | 9974 | －180 | 0386 | 0592 | 0798 | 100 | 72 |
| 73 | 8160 | 8122 | 8084 | 8045 | 8007 | 789 | 793 | 7892 | 7853 | $71 \cdot 7815$ | 13.0943 | 1152 | 1361 | 1570 | 1779 | 1988 | 2197 | 2406 | 261 | 282 | 73 |
| 74 | 7998 | 7959 | 7920 | 7882 | 7843 | 7804 | 7765 | 7726 | 7687 | 72.7648 | 13.2737 | 2949 | 3161 | 3372 | 3584 | 3796 | 4008 | 4219 | 4431 | 464 | 74 |
| 75 | 7836 | 7796 | 7757 | 7718 | 7679 | 7639 | 7600 | 7560 | 7521 | $73 \cdot 7481$ | 13.4531 | 4746 | 4960 | 5175 | 5389 | 5604 | 581 | 6033 | 6248 | 64 | 75 |
| 76 | 7673 | 7634 | 7594 | 7554 | 7514 | 7474 | 7434 | 7394 | 7354 | 74.7314 | 13．6325 | 6542 | 6760 | 6977 | 7195 | 7412 | 762 |  | 806 |  | 76 |
| 78 | 7511 | 7471 | 7431 | 7390 | 7350 | 7310 | 7269 | 7228 | 7188 | 75：7147 | $13 \cdot 8118$ | 8339 | 8559 | 8779 | 9000 | 9220 | 9440 | 9661 | 9881 | －101 | 77 |
| 78 | 7349 | 7308 | 7268 | 7227 | 7186 | 7145 | 7104 | 7063 | 7021 | 76.6980 | 13.9912 | ＋135 | 0359 | 0582 | 0805 | 1028 | 1251 | 1474 | 1698 | 192 | 78 |
| 79 | 7187 | 7146 | 7104 | 析 | 7021 | 6980 | 6938 | 6897 | 6855 | 77．6813 | 14.1706 | 1932 | 2158 | 2384 | 261 | 283 | 306 | 3288 | 351 | 378 | 79 |
| 80 | 7025 | 6983 | 6941 | 6899 | 6857 | 6815 | 6773 | 6731 | 6689 | 78．6646 | 14.3500 | 3729 | 3958 | 4186 | 441 | 464 | 4873 | 5102 | 533 | 556 | 80 |
| 81 | 6862 | 6820 | 6778 | 6735 | 6693 | 6650 | 6608 | 6565 | 6522 | 79．6479 | 14.5293 | 5525 | 5757 | 5989 | 6220 | 6452 | 6684 | 6916 | 7147 | 737 | 81 |
| 82 | 6700 | 6657 | 6615 | 6572 | 6529 | 6485 | 6442 | 6399 | 6356 | 80.6312 | 14.7087 | 7322 | 7556 | 7791 | 8026 | 8260 | 8495 | 8729 | 8964 | 919 | 82 |
| 83 | 6538 | 6495 | 6451 | 6408 | 6364 | 6321 | 6277 | 6233 | 6189 | 81．6146 | $14 \cdot 8881$ | 9118 | 9356 | 9593 | 9831 | ＋068 | 0306 | 0543 | 0781 | 1018 | 83 |
| 84 | 6376 | 6332 | 6288 | 624 | 62 | 6156 | 6112 | 6067 | 6023 | 82．5979 | 15.0675 | 0915 | 1155 | 1396 | 1636 | 1876 | 2117 | 2357 | 2597 | 2838 | 84 |
| 85 | 621 | 6169 | 6125 | 6080 |  | 5991 | 594 | 59 | 5857 | 83.5812 | $15 \cdot 2468$ | 2712 | 2955 | 319 | 344 | 3684 | 3928 | 417 | 4414 | 4657 | 85 |
| 86 | 6051 | 6007 | 5962 | 5917 | 5871 | 5826 | 5781 | 5736 | 5690 | 84．5645 | 15．4262 | 4508 | 4754 | 5000 | 5246 | 5492 | 573 | 5985 | 6231 | 647 | 86 |
| 87 | 5889 | 5844 | 5798 | 5753 | 5707 | 5661 | 5616 | 5570 | 5524 | 85.5478 | 15.6056 | 6305 | 6554 | 6803 | 7052 | 7301 | 7549 | 7798 | 8047 | 8296 | 87 |
| 88 | 5727 | 5681 | 5635 | 5589 | 5543 | 5497 | 5450 | 5404 | 5358 | 86.5311 | 15.7850 | 8101 | 8353 | 8605 | 8857 | 9109 | 9360 | 9612 | 9864 | \＄11 | 88 |
| 89 | 5565 | 5518 | 5472 | 5425 | 5379 | 5332 | 5285 | 5238 | 5191 | 87.5144 | 15.9643 | 889 | －153 | 0407 | 066 | 091 | 117 | 14 | 168 |  | 8 |
| 90 | 5403 | 5356 | 5309 | 5262 | 5214 | 5167 | 5120 | 5072 | 5025 | 88．4977 | 16.1437 | 169 | 1952 | 2210 | 2467 | 2725 | 2982 | 3240 | 3497 | 3755 | 90 |
| 91 | 5241 | 5193 | 5145 | 5098 | 5050 | 5002 | 4954 | 4906 | 4858 | 89.4810 | 16.3231 | 3491 | 3752 | 4012 | 4272 | 4533 | 4793 | 5053 | 5314 | 557 | 91 |
| 92 | 5078 | 5030 | 4982 | 4934 | 4886 | 4837 | 4789 | 4741 | 4692 | 90．4643 | 16.5025 | 5288 | 5551 | 5814 | 6078 | 6341 | 6604 | 6867 | 7130 | 739، | 92 |
| 93 | 4916 | 4868 | 4819 | 4770 | 4721 | 4673 | 4624 | 4575 | 4526 | 91：4476 | 16.6818 | 7084 | 7351 | 7617 | 7883 | 8149 | 8415 | 8681 | 8947 | 9213 | 93 |
| 94 | 4754 | 4705 | 4656 | 4606 | 4557 | 4508 | 4458 | 4409 | 4359 | 92．4309 | $16^{8612}$ | 8881 | 9150 | 9419 | 9688 | 9957 | － 226 | 0495 | 0764 | 103 | 94 |
| 95 | 4592 | 4542 | 4492 | 迷 | 93 | 4343 | 4293 | 4263 | 4193 | 93．4143 | 17.0406 | 0678 | 0950 | 122 | 1493 | 176 | 2037 | 2305 | 258 | 2852 | 95 |
| 96 | 4430 | 4379 | 4329 | 4279 | 4229 | 4178 | ｜ 4128 | 4077 | 4026 | 94－3976 | $17 \cdot 2200$ | 2474 | 2749 | 3024 | 3298 | 3573 | 3848 | 4122 | 4397 | 4672 | 96 |
| 97 | 4267 | 4217 | 4166 | 4115 | 4064 | 4013 | 3962 | 3911 | 3860 | $95 \cdot 3809$ | 17.3993 | 4271 | 4548 | 4826 | 5104 | 5381 | 5659 | 5936 | 6214 | 6491 | 97 |
| 98 | 4105 | 4054 | 4003 | 3951 | 3900 | 3849 | 3797 | 3745 | 3694 | $96 \cdot 3642$ | $17 \cdot 5787$ | 6067 | 6348 | 6628 | 6909 | 7189 | 7469 | 7750 | 8030 | 8311 | 98 |
| 99 | 3943 | 3891 | 3840 | 3788 | 3736 | 3684 | 3632 | 3579 | 3527 | 97－3475 | 177581 | 7864 | 8147 | 8431 | 8714 | 8997 | 9280 | 9564 | 9847 | －130 | 99 |
| 100 | 3781 | 3729 | 3676 | 3624 | 3572 | 3519 | 3466 | 3414 | 3361 | $98 \cdot 3308$ | 17.9375 | 9661 | 9947 | ＋233 | 0519 | 0805 | 1091 | 1377 | 1664 | 1950 | 100 |
|  | 40＇ | 39＇ | 38 | 37 | 36 | 35 | 34 | 33＇ | $32^{\prime}$ | 31 | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | 37 | 36 | ｜ $35^{\prime}$ | 34＇ | $33^{\prime}$ |  | $31^{1}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $9^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

| $10^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $10^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | 55＇ | $56^{\prime}$ | $57^{\prime}$ | $58^{\prime}$ | $59^{\prime}$ | $50^{\prime}$ | 51 | $52^{\prime}$ | $53^{\prime}$ | 54 | $55^{\prime}$ | 56 | 57 | 58 | $59^{\prime}$ |  |
|  | 982 | 982 | 9821 | 9820 | ｜ 9820 | 98 | 9818 | 9818 | 9817 | 9817 | 1880 | 1882 | 885 | 1888 | 1891 | 1894 | 1897 | 000 | 1902 | 1905 |  |
|  | 964 | 9642 | 9641 | 40 | 9639 | 963 | 96 | 36 | 96 | ． 9634 | 3759 | 3765 | 3770 | 3776 | 3782 | 378 | 379 | 3799 | 3805 | 3810 |  |
|  | 9465 |  |  |  |  | 9457 | 94 | 9454 | 9452 | 2.945 | 5639 | 5647 | 5656 | 5664 | 5673 | 5681 | 5690 | 5699 | 5707 | 5716 |  |
|  | 9287 | 928 | 9283 | 9281 | 78 | 276 | 92 | 9272 | 70 | ． 92 | 7518 | 30 | 7541 | 7552 | 7564 | 757 | 7587 | 7598 | 7610 | 7621 |  |
|  | 9109 | 9106 |  |  |  | 90 | 9092 | 9090 | 9087 | $4 \cdot 9084$ | 9398 | 9412 | 9426 | 4440 | 455 | 946 | 9483 | 9498 | 9512 | 952 |  |
| 6 | 8931 | 89 |  | 21 | 8918 | 8914 | 89 | 8908 | 890 | 5.8901 | $1 \cdot 1277$ | 1294 | 13 | 1329 | 1346 | 1363 | 1380 | 1397 | 1414 | 1431 |  |
|  | 875 | 8749 |  | 874 |  | 87 |  |  |  |  |  | 3177 | 3197 | 3217 | 3237 | 3257 | 3277 | 3297 | 17 | 3337 |  |
|  | 8574 | 857 | 8565 | 8561 | 8557 | 85 | 85 | 8 | 85 | 7.853 | 5036 | 50 | 50 | 5105 | 512 | 515 | 5173 | 5196 | 5219 | 5242 |  |
|  |  |  |  |  |  |  |  |  | 8356 |  | 916 |  | 6967 | 6993 | 019 | 7044 | 7070 |  | 121 |  |  |
| 10 | 8218 | 8212 | 8207 | 8201 | 8196 | 8190 | 8185 | 8179 | 8174 | 9.8168 | 8795 | 8824 | 8852 | 8881 | － | 8938 | 896 | 8995 | 024 | 9052 | 10 |
| 11 | 8040 | 80 | 8028 | 8022 | 8015 | 8009 | 80 | 7997 | 7991 | 10. | 2.0675 | 0706 | 0738 | 0769 | 0800 | 0832 | 0863 | 0895 | 0926 | 0958 |  |
| 12 | 786 | 7855 | 7848 | 78 | 785 | 782 | 78 | 78 |  | 11.7802 |  |  |  |  |  | 27 | 2760 | 2794 | 2829 | 2863 | 12 |
| 13 | 768 | 76 |  |  | 7655 | 764 | 76 | 7 | 7626 | 12.7619 | ． 4434 | 4471 | 4508 | 4545 | 4582 | 46 | 4657 | 4694 | 4731 | 4768 | 13 |
| 14 | 7505 | 749 | 7490 | 7482 | 7474 | 746 | 74 | 74 | 74 | 13.7 | 6313 | 63 | 6393 | 643 | 647 | 65 | 6553 | 65 | 633 | 6673 |  |
| 15 | 732 | 73 |  |  |  | 7286 | 7277 |  |  | 147252 | 2.8193 | 82 | 8279 | 32 | 336 | 840 | 8450 | 3493 | 8536 | 8579 | 15 |
| 16 | 71 |  |  |  |  | 7105 |  |  | 7078 |  | 3.0072 |  | 016 | 0210 | 0255 |  |  |  |  |  | 16 |
| 17 | 697 | 69 | 6952 | 6942 | 6933 | 692 | 69 |  |  |  | ， |  |  | 2098 | 214 | 2195 |  |  |  |  | 18 |
| 18 | 679 | 6782 | 6772 | 6762 | 6753 | 674 | 67 | 6723 | 6713 | 17.670 | 3832 | 3883 | 39 | 39 | 403 | 40 | 4140 | 41 | 3 | 429 | 18 |
| 19 | 661 |  | 6593 |  | 6572 | 65 | 65 | 654 | 653 | 18.65 | 5 | 5765 | 58 | 58 | 59 | 59 | 6037 | 6091 | 45 |  |  |
| 20 | 6436 | 642 | 6414 | 6403 | 6392 | 6381 | 6370 | 6359 | 6348 | 19.6337 | 3.7591 | 76 | 7705 | 7762 | 781 | 787 | 793 | 799 | 48 | 810 | 20 |
| 21 | 625 | 6246 | 6234 | 6223 | 6211 | 6200 | 61 | 6177 | 165 | 20 | 3.9470 | 9530 | 959 | 965 | 9710 | 977 | 983 | 9890 | 9950 | ． 010 |  |
| 22 | 607 |  |  |  |  |  |  |  |  | 21.597 |  | 1412 | 1475 | 1538 | 1601 | 16 | 172 |  |  |  | 22 |
| 23 | 590 | 58 | 587 | 5863 | 5851 | 58 | 58 | 5812 | 580 | ． 57 | $4 \cdot 322$ | 329 | 33 | 3426 | 3492 | 35 | 3623 | 3689 | 3755 | 382 | 23 |
| 24 | 572 | 57 |  |  | 5670 |  |  |  | 17 | $23 \cdot 560$ | 51 | 517 | 52 | 53 | 53 | 545 | 55 | 5589 |  | 572 | 24 |
| 25 | 55 | 553 |  |  | 5490 |  |  |  |  | $24 \cdot 5421$ |  |  |  | 202 | 7274 | 7345 |  |  |  |  | 25 |
| 26 | 536 | 5352 | 5338 | 5324 |  |  |  |  | 5252 | $25^{\circ} 5237$ | 4.8868 |  | 9016 |  | 9165 | 239 |  |  |  |  | 26 |
| 27 | 5188 | 51 | 5159 |  |  | 511 |  | 508 |  | $26 \cdot 5$ |  |  |  |  | 105 | 1133 | 12 | 1287 | 1364 | 1441 | 27 |
|  | 5010 |  |  |  | 4948 | 促 | 4918 |  | 4887 | －48 | 5.2627 | 2707 | 27 | 2867 | 294 | 30 | 31 | 31 | 3267 | 3347 | 28 |
| 29 | 4832 | 481 | 48 | 4784 | 4768 | 4752 | 4736 | 472 | 470 | 28 | $5 \cdot 450$ | 45 | 46 | 475 | 4838 | 492 | 50 | 586 | 5169 | 5252 | 29 |
| 30 | 4653 | 463 | 4621 | 4604 | 4588 | 4571 | 4555 | 38 | 4521 | 29.450 | 5.6386 | 6472 | 65 | 664 | 6729 | 681 | 69 | 698 | 7071 | 7157 | 30 |
| 31 | 4475 | 4458 | 4441 | 4424 | 4407 | 439 | 437 |  |  | 30.432 | 5.826 | 8354 |  | 8531 | 8620 | 8708 | 8797 | 8885 | 8974 | 9062 | 31 |
| 32 | 42 | 427 |  |  | 42 |  | 419 |  |  | ， | ， |  |  |  | 0511 |  |  |  |  |  |  |
| 33 | 41 | 410 | 4083 | 4065 | 4046 | 4028 | 010 | 3992 | 3974 | $32 \cdot 3$ | ． 202 | 2119 | 2213 | 2307 | 240 | 24 | 25 | 2684 | 2779 | 28 | 33 |
| 34 | 394 |  |  |  |  | 3847 | 3828 | 3810 | 3791 | 33．37 | 390 |  |  | 41 | 429 | 43 | 44 | 45 | 4681 | 477 |  |
| 35 | 376 | 37 | 3724 | 3705 |  | 3666 | 3647 |  | 3608 |  |  |  |  | 683 |  |  |  |  |  |  | 35 |
| 36 | 358 | 35 | 3545 | 3525 | 3505 | 3485 | 3465 | 3446 | 3426 | 35．340 | 6.766 | 7766 | 786 | 797 | 8074 | 817 |  |  |  |  | 36 |
| 37 | 34 | 33 |  |  |  | 330 | 328 |  | 3243 |  |  |  | 9754 | 9860 | 996 | 1071 |  |  |  |  |  |
| 38 | 32 | 320 |  |  |  | 3123 |  |  |  | 37－303 |  |  |  | 174 | 185 | 1965 |  |  |  |  | 38 |
| 39 | 30 | 3028 | 3007 |  | 2964 | 294 | 292 |  | 2878 | $38 \cdot 285$ |  | 34 | 35 | 3636 | 3747 | 源 | 397 | 4081 | 4193 | 430 |  |
| 40 | 2871 | 2849 | 2827 | 2805 | 2783 | 2761 | 27 | 2717 | 2695 | 39．2673 | $7 \cdot 5181$ | 529 | 5410 | 552 | 563 | 575 | 586 | 59 | 60 | 620 | 40 |
| 41 | 2693 | 267 | 2648 |  |  |  |  |  | 2513 | 40.249 | $7 \cdot 7061$ |  |  |  |  |  |  |  |  |  |  |
| 42 | 2515 | 249 |  |  |  |  |  | 235 | 2330 | 4123 | 89 |  |  | 930 |  |  |  |  |  |  | 42 |
| 43 | 233 | 2313 | 22 |  | 2242 | 2219 |  | 21 | 2147 | 42 |  |  |  | 1188 | 131 | 1434 |  |  | 1802 | 192 | 43 |
| 44 | 215 | 21 | 2110 |  | 2062 |  | 2013 |  |  | 4 |  | 2825 |  | 3076 | 3202 | 33 |  |  |  |  | 44 |
| 45 | 198 | 19 |  | 1906 | 18 | 1857 | 1832 | 180 | 1782 | 44．175 | 4579 | 470 | 4836 | 496 | 509 | 522 | 535 | 547 | 5607 |  | 45 |
| 46 | 1802 | 1777 | 1752 | 1726 | 1701 | 1676 | 1650 | 1625 |  | $45 \cdot 157$ |  | 65 |  | 685 | 698 | 71 | 72 |  | 509 |  |  |
| 47 | 16 |  |  |  | 1521 |  |  |  | 1417 | 46 |  |  |  |  |  |  |  |  | 941 |  | 47 |
| 48 | 14 | 14 | 13 | 13 | 1340 | 1314 | 128 |  | 1234 | 47 | 221 |  |  |  |  | 0903 |  |  |  |  | 48 |
| 49 | 12 |  | 12 |  |  | 1133 | 110 |  |  |  |  |  |  |  | 265 |  |  |  | 3217 |  |  |
| 50 | 1089 | 1062 | 1034 | 1007 | 0979 | 0952 | 0924 | 0897 |  | 49 | 9.3976 | 4119 | 42 | 4405 | 4548 | 4691 | 4833 | 4976 | 5119 | 5262 | 50 |
| 51 | 09 | 0883 | 0855 | 0827 |  | 077 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 073 | 07 | 06 |  |  |  |  |  | 05 | 51.04 | 773 |  |  |  | 833 | 847 |  | 877 | 8924 | 907 |  |
| 53 | 0554 | 05 |  |  |  |  | 03 | 033 | 03 | 52.02 | ． 96 |  |  | ＋0 | 022 | 037 | 05 |  |  |  |  |
| 54 | 037 | 03 | 031 | 0287 | 0258 | 0228 | 0198 | 0168 |  | 53 | 10.149 |  | 18 |  | 21 |  |  |  |  | 288 |  |
| 55 | 01 |  |  |  |  |  | ＋017 |  |  | 53.9925 | $10 \cdot 3374$ | 353 |  | 3845 | 4002 | 41 | 431 | 447 | 463 | 478 | 55 |
| 56 | 10 |  |  |  |  |  |  |  |  |  | 10.5 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 778 |  |  |  |  |  |  |
| 58 | 96 | 963 | 960 | 9568 |  | 23 | 94 |  | 9408 |  | 10 |  | 934 | 95 | 967 | 984 | \＄0 | 01 | 0338 | 050 |  |
| 59 |  |  |  |  |  |  |  |  | 9225 |  | 11 |  |  | 139 | 156 | 173 |  | 20 |  |  |  |
| 60 | 93 | 9274 | 924 | 9208 | 9175 | 9142 | 9109 | 9076 | 9043 | 58．9010 | 2772 | 2943 |  | 3286 | 345 | 362 | 3800 | 39 | 41 | 431 | 60 |
| 61 | 912 |  | 906 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 89 |  |  |  |  |  |  |  | 867 | 60．864 | 11.65 |  |  |  |  |  |  |  |  |  |  |
| 63 | 87 |  |  |  |  |  |  |  |  |  | 11.8410 |  |  |  | 13 | 析 |  |  |  |  |  |
| 64 | 85 | 855 | 85 |  |  | 8418 | 838 | 834 | 831 | $62 \cdot 827$ | 12.0 |  | 06 | 083 | 1021 | 120 | 138 | 15 | 175 | 193 |  |
| 65 | 84 |  |  |  |  |  |  |  |  | $63 \cdot 809$ | 12．2169 |  |  | 2726 | 2912 |  | 328 |  | 3655 | 840 |  |
| 6 |  |  |  |  |  |  |  |  |  |  | $12 \cdot 40$ |  |  |  |  |  |  |  |  |  |  |
| 67 | 805 | 802 | 79 |  | 7912 | 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 7881 |  |  |  |  | 7695 | 7657 | 7619 | 7582 | $66 \cdot 754$ | 12.780 | 80 | 81 | 839 | 858 | 877 | 8973 | 91 | 93 | 95 |  |
| 69 | 7703 |  | 7627 |  |  |  |  |  |  |  |  |  |  | 0279 |  | 673 |  |  |  |  | 98 |
| 70 | 752 | 7486 | 7448 | 7410 | 7371 | 仿 | 7294 | 25 | 721 | 68.7178 | 13．156 | 17 | 196 | 216 | 236 | 256 | 276 | 296 |  | 336 | 70 |
| 71 | 7 | 712 |  | 7230 | 7191 | 7152 | 712 |  | 7034 | 69 |  | 36 | 38 | 405 | 425 | 446 |  |  |  |  |  |
|  | 寿 |  |  |  |  |  |  | 6891 | 6851 | $70 \cdot 68$ |  |  |  | 593 | 614 | 6354 |  |  |  |  |  |
| 73 | 6990 | 6950 | 6910 | 687 | 830 | 6790 | 6749 | 6709 | 6669 | 71.6 |  |  |  | 7 19 | ， | 824 |  |  |  |  | 73 |
| 74 | 6812 |  |  |  |  | 6609 | 6568 | 6527 | 686 | 72 | 13.9085 | 9296 | 950 | 9719 | 993 | ＋14 | 035 | 05 | 0776 | － |  |
| 75 | 6634 | 659 | 6551 | 10 |  | 6428 |  |  |  |  | 14.096 | 117 | 139 | 1607 | 1822 | 20 | 22 | 24 | 2678 | 289 | 75 |
| 76 | 6455 | 6414 | 6372 | 330 | 8289 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 77 | 627 | 623 | 619 | 6151 | 6108 | 606 | 6023 | 598 | 5938 | 75.589 | 14.472 | 4944 | 516 | 5384 | 5603 | 582 | 6043 | 626 |  |  | 77 |
| 78 | 509 |  |  |  |  | 5885 |  |  | 5756 | 76.571 | 14.66 | 682 | 7049 | 7272 | 749 | 771 | 79 | 81 | 83 | 86 | 78 |
| 79 | 5921 | 5877 | 5834 | 5791 | 5747 | 5704 | 5660 | 561 | 5573 | 77.5529 |  |  | 8934 | 仡 | 938 | 961 |  |  |  |  | 79 |
| 80 | 57 | 5699 | 5655 | 5611 | 55 | 5523 | 5479 | 5435 | 5390 | 78.5346 | 15.0362 | 059 | 081 | 1048 | 1276 | 150 | 173 | 196 | 21 | 24 | 80 |
| 81 | 556 |  |  | 5431 5251 | 5387 | 534 | 52 | 5253 | 520 | 79．516 | 15．224 | 24 | 270 | 2936 | 3167 | 339 |  |  | 409 |  |  |
| 82 | 538 | 55 | 51 | 507 | 52 | 519 | 516 |  | 5025 | 80．498 | 15.412 | 435 | 4 | 4824 | 505 | 5293 | 523 |  |  |  | 82 |
| 83 | 520 | 516 | 5117 | 5071 | 50 | 4980 | 4934 | 4888 | 4843 | 81.479 | 15.600 | 623 | 647 | 6712 | 6949 | 7186 | 742 | 9560 |  |  |  |
| 85 | 5030 | 48 | 4 | 4892 | 4845 | 4799 | 4751 |  | 46 | 82．4613 | 15.788 | 81 | 8360 | 8600 | 884 | 908 | 93 | 9560 | 98 |  | 84 |
| 85 | 4851 | 4805 | 4758 | 4712 | 4665 | 4618 | 4571 |  | 4668 | 83.443 | 15.976 |  | d 3 |  | d | 矿 | 121 |  |  |  | 85 |
| 86 | 4673 | 4626 | 4579 | 4532 | 4484 | 4437 | 439 | 4342 | 4295 |  |  |  |  |  |  | 析 |  |  |  |  | 86 |
| 87 | 4495 | 4447 | 4400 | 4352 | 4304 | 4256 | 4208 | 416 | 4112 | $85 \cdot 4064$ | 16.351 | 376 | 4016 | 4265 | 4513 | 476 | 501 | 525 |  |  | 87 |
| 88 | 4317 | 4269 | 4220 | 499 | 4124 | 4075 | 4027 | 3978 | 3929 | 86－388 | $16 \cdot 539$ | 565 | 5901 | 6153 | 6404 | 665 | 690 | 仡 | 7409 |  | 88 |
| 89 | 4139 | 90 | 41 | 3992 | 3943 | 3894 | 3845 | 3796 | 3747 | 87－3698 | 16.7278 | 7532 | 7786 | 8041 | 8295 | 8549 | 880 | 905 | 93 |  | 89 |
| 90 | 39 | 3911 |  | 3812 | 3763 | 3713 | 36 | 3614 | 3564 | 88.3514 | 16.9158 | 9415 | 9672 | 992 | －18 | 044 | 070 | 095 | 1214 | 147 | 90 |
| 91 | 378 | 3732 |  | ） | 82 | 矿 |  |  |  | 89.3331 | $17 \cdot 1037$ | 129 | 15 | 1817 | 207 | 2337 | 297 | 285 | 3116 |  | 91 |
| 92 | 360 | 3554 | 3503 | 3453 | 3402 | 3351 | 3301 | 3250 | 析 |  |  |  | 344 | 3175 |  | 4231 | 4493 | 4756 | 5016 | 528 | 92 |
|  | 342 | 3315 | 3324 | 3273 | 3222 | 3170 | 3119 | 3068 | 3016 | $91 \cdot 296$ | $17 \cdot 4796$ | 506 | 5327 | 5593 | 5859 | 6124 | 6390 | 6656 | 6921 | 718 | 93 |
| 94 | 324 | 3156 | 3144 | 3093 | 3041 | 2989 | 2938 | 886 | 2834 | 92．278 | 676 | 694 | 213 | 748 | 7750 | 8018 | 828 | 555 | 882 | 909 | 94 |
| 95 | 3069 | 3017 | 2965 | 13 | 2861 | 05 | 2756 | 704 | 2 | 93.259 | $17 \cdot 855$ |  | 9098 | 硣 | 析 | －18 | 1183 | 矿 |  |  | 95 |
| 96 | 289 | 2838 | 86 | 2733 | 80 | 2628 | 2575 | 2522 | 2468 | 94．2415 | 18.0435 | 070 | 0983 | 1257 | 1532 | 1806 | 2080 | 2354 | 262 | 硅 | 96 |
| 97 | 271 | 268 | 260 | 2533 | 2500 | 2447 | 2393 | 2340 | 2286 | 95．223 | 18.2314 | 259 | 2868 | 3146 | 3423 | 3700 | 3977 | 4254 | 45 | 480 | 97 |
| 98 | 253 | 248 | 2427 | 2373 | 2320 | 2266 | 2212 | 2157 | 2103 | 962049 | 4194 | 4474 | 4754 | 5034 | 5313 | 5593 | 7770 | 6153 |  | 6713 | 98 |
|  | 2356 | 2302 | 2248 | 2194 | 2139 | 2085 | 2030 | 1975 | 1921 | 97＇186 | 18.6073 | 6356 | 6639 | 6922 | 7204 | 7487 | 777 | 805 | 83 | 86 | 99 |
| 100 | 2178 | 2123 | 2069 | 2014 | 1959 | 1904 | 84 | 1793 | 1738 | 98•168 | $18 \cdot 7953$ | 8239 | 8524 | 8810 | 9095 | 9381 | 9667 | 9952 | －238 | 5523 | 100 |
|  | $0^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7{ }^{\prime}$ | $0^{\prime}$ | $5^{\prime}$ | ${ }^{\prime}$ | ${ }^{\prime \prime}$ | ${ }^{\prime}$ |  | 10 | $9^{\prime}$ |  | $7^{\prime}$ | 16 | T | $4^{\prime}$ | 3 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | NE． |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $11^{6}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $11^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L0＇ | $11^{\prime}$ | $12^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | 16＇ | 17 | 18 | 19 | $10^{\prime}$ | 11 | 12 | $13^{\prime}$ | 4＇ | $15^{\prime}$ | 16 | $17^{\prime}$ | 18 | $19^{\prime}$ |  |
|  | 9811 | 9810 | 9810 | 9809 | 9808 | 9808 | 07 | 9807 | 9806 | 980 | 937 | 1939 | 1942 | 1945 | 1948 | 1951 | 1954 | 1957 | 1959 | 962 |  |
| 2 | 962 | 9620 | 96 | 961 | 961 | 9616 | 9615 |  | 9612 | $1 \cdot 9611$ | 仡 | 3879 | 3885 | 3890 | 3896 | 39 | 390 | 391 | 39 |  |  |
| 3 | 9432 | 30 | 9429 | 9427 | 9425 | 9424 | 9422 | 94 | 9418 | 2.9417 |  | 5818 | 5827 | 5836 | 5844 | 5853 | 5861 | 5870 | 5878 | 5887 |  |
| 4 | 92 |  |  | 9236 |  |  | 9229 | 9227 | 9225 |  |  | 775 | 7769 |  | 9792 | 80 | 7815 | 7826 | 7838 | 7849 |  |
| 5 | 9053 | 9051 | 9048 | 45 | 9042 | 9039 | 36 | 9034 | 9031 | 4.9028 | 683 | 9697 | 9712 | 9726 | 9740 | 9755 | 97 | 978 | 9797 | 9812 |  |
| 6 | 8864 | 886 | 8857 | 88 | 8851 | 8847 | 8844 | 8840 | 88 | $5 \cdot 8$ | 1620 | 1637 | 1654 | 1671 | 1688 | 1705 | 1723 | 1740 | 1757 |  |  |
|  | 862 |  |  |  |  |  |  | 8647 | 8643 |  |  | 35 | 3596 |  | 636 | 3656 | 3676 | 3696 | 3716 | 年373 |  |
| 8 | 8485 | 8481 | 8476 | 8472 | 8467 |  | 8458 | 8454 | 8449 |  | － 5493 | 5516 | 5539 | 5562 | 84 | 560 | 563 | 5653 | 5676 | 569 |  |
| 9 | 8296 | 829 |  |  |  |  | 8266 |  | 825 |  | 7430 | 7455 | 7481 |  | 7532 | 7558 |  | 7609 | 7635 |  |  |
| 10 | －1 |  |  |  |  |  |  |  |  |  |  |  |  |  | 448 | 9509 | 9538 | 9566 | 9595 | 9623 | 0 |
| 11 | 7917 | 7911 | 7905 | 7899 | 7893 |  |  |  | 7868 | $10^{\circ}$ | ． 1303 | 1334 | 1366 | 1397 | 142 | 1460 | 1491 | 1523 | 1554 | 158 | 11 |
| 1 | 7728 | 772 | 771 | 77 | 770 | 7694 | 7687 | 7681 | 767 | 1 | $2{ }^{2}$ | 32 | 33 | 3342 | 3377 | 3411 | 344 | 34 | 3514 | 3548 | 2 |
| 13 | 7539 | 7532 | 7524 | 7517 |  |  |  | 7487 | 7480 | 12 | 2.5176 | 52 | 5250 | 5288 | 5325 | 5362 | 539 | 5436 | 5473 | 5510 | 13 |
| 14 | 735 |  | 7334 |  |  |  |  | 7294 | 7286 |  |  | 715 | 719 | 72 | 7273 | 7313 | 7353 | 7393 | 32 | 7472 | 4 |
| 15 | 716 | 7152 | 7143 | 713 | 71 | 7118 |  | 7101 |  | 14 | 905 | 909 | 9135 | 9178 | 22 | 9264 | 9306 | 93 | 9392 | 9435 | 15 |
| 16 | 69 | 962 | 69 | 69 | 6935 | 6926 | 6917 | 6907 | 6898 |  |  | 1032 | 1078 | 1123 | 1169 | 1214 | 1260 | 1306 |  | 1397 | 16 |
| 17 | 67 |  |  |  |  |  |  | 6714 | 6704 |  |  | 2971 | 3020 | 3068 | 3117 | 3165 | 3214 | 3262 | 3311 | 3359 | 17 |
| 18 | 659 | 658 | 6572 | 65 | 65 | 6541 | 653 | 652 | 65 | $17 \cdot 6$ | 3485 | 49 | 4962 | 50 | 5065 | 51 | 51 | 52 | 5270 | 532 | 18 |
| 19 |  |  |  |  |  |  | 63 | 6328 | 6317 | 18.63 |  | 6850 | 6905 | 6959 | 013 | 7067 | 7121 | 76 | 30 |  |  |
| 20 | 6214 | 6202 |  |  |  |  |  | 34 | 612 | ．611 | 3.8733 | 8790 | 8847 | 04 |  | 9018 | 907 | 913 | 9189 | 9246 | 20 |
| 21 | 6024 | 6012 | 6001 |  |  | 5965 | 5953 | 5941 | 5929 | 20．5917 | 4.066 | 0729 | 07 | 0849 | 0909 | 0969 | 1029 | 1089 | 1149 | 20 | 21 |
| 22 | 58 | 5823 | 58 | 57 | 578 | 57 |  | 5748 | 573 | 21.57 | 426 |  | 27 |  |  | 292 | 2983 | 045 |  |  | 22 |
| 2 | 56 |  |  |  |  |  |  | 55 |  | 22.552 |  | 4608 | 4674 | 4740 | 4805 | 487 | 4936 | 502 | 5068 | 5133 | 23 |
| 24 | 545 | 5443 | 5429 | 5416 | 5402 | 5388 | 53 | 5361 | 5348 | 23.533 | 6479 | 6548 | 6616 | 668 | 6753 | 68 | 6890 | 6959 | 7027 |  | 24 |
| 25 | 526 | 5253 | 5239 | 5225 | 5211 |  | 518 |  |  | 24．5139 | 8416 |  | 8559 | 8630 |  | 87 |  | 8915 | 8987 |  | 25 |
| 26 | 50 | 5063 | 504 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 488 |  |  |  |  |  |  |  |  |  |  |  | 2443 |  |  |  |  |  |  |  |  |
| 28 | 46 | 4683 | 4667 | 46 | 46 | 4620 | 4604 | 4588 | 4572 | $27 \cdot 45$ | ． 42 | 4306 | 4386 | 446 | 4545 | 4625 | 4705 | 4785 | 4865 | 494 | 28 |
| 29 | 451 |  |  |  |  |  |  | 4395 | 4378 |  |  |  | 6328 | 641 | 6493 | 6576 | 665 | 6742 | 6824 | 6907 |  |
| 30 | 432 | 4303 | 42 | 4270 | 42 | 4236 | 4219 | 4201 | 4184 | 29.4167 | $5 \cdot 8099$ | 818 | 8270 | 8356 | 8442 | 85 | 86 | 869 | 888 | 886 | 30 |
| 31 | 41 | 4114 | 4096 | 4079 | 4061 | 4043 | 4026 | 4008 | 399 | 30． 3973 | 6.0036 | 0124 | 0213 | 0301 | 039 | 047 | 0566 | 0655 | 0743 | 083 | 31 |
| 32 | 3942 | 3924 |  | 3888 |  |  | 3833 |  |  | 31．37 |  |  |  |  |  |  |  | 2611 |  |  | 2 |
| 33 | 37 |  |  |  |  |  |  |  |  | $32 \times 35$ |  |  |  |  |  | 438 | 447 | 456 |  |  |  |
| 34 | 35 | 354 | 352 |  | 3486 | 3467 |  |  |  | $33 \cdot 33$ | ． 58 | 5943 | 6040 | 613 | 6234 | 6331 | 6428 | 652 | 6622 |  | 34 |
| 35 | 3374 | 3354 |  | 3315 | 3295 | 3275 | 3255 | 3235 | 3215 | $34 \cdot 3195$ | 7782 | 7882 | 7982 |  | 8182 |  | 8381 | 8481 | 881 | 868 | 35 |
| 36 | 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 36 |
| 37 | 29 |  |  |  |  |  |  | 2848 | 282 |  |  |  |  |  |  | 21 |  |  | 2500 |  | 37 |
| 38 | 28 |  |  |  |  |  |  |  |  |  | 35 |  |  |  |  | 41 |  | 4351 |  |  | 38 |
| 39 | 2617 |  |  |  |  | 2506 | 248 | 2462 | 2440 | 3824 | 年 | 640 | 575 |  |  | 608 | 1963 | 630 | 641 |  |  |
| 40 | 2427 |  | 2382 | 2359 | 2337 | 2314 | 229 | 69 | 46 | 39．222 | 7465 | 580 | 7694 | 780 | 7922 | 8036 | 8150 | 826 | 8378 | 49 | 0 |
| 41 | 22 | 2215 | 2192 | 2168 | 2145 | 2122 |  | 2075 | 2052 |  | 7.940 | 9519 | 9636 | 775 | 9870 | 9987 | －104 | 0221 |  | 045 | 41 |
| 42 | 20 | 2025 |  |  |  |  |  |  |  | 41.18 |  | 1459 | 157 |  |  |  |  | 2178 |  |  | 42 |
| 43 | 1859 | 183 | 181 | 17 | 1762 | 1738 | 1713 |  |  | 42．16 | 82 |  | 352 | 364 | 37 | 388 | 4012 | 413 | 4257 | 438 | 43 |
| 44 | 16 | 1645 |  |  | 1570 | 1546 |  |  |  | $43 \cdot 14$ |  | 53 | 5463 |  |  | 5840 | 5965 | 609 | 627 |  | 44 |
| 45 | 148 | 1455 |  | 140 |  |  |  |  |  | 44．125 |  | 7277 |  |  |  |  | 919 | 047 | 3176 |  | 45 |
| 45 | 129 | 1265 |  |  |  |  |  |  |  |  |  |  | 348 |  |  |  |  |  |  |  | 46 |
| 47 | 110 | 107 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 47 |
| 48 | 09 | 088 | 085 |  |  |  |  | 0722 |  | 47．06 |  |  | 323 |  | 35 | 36 | 3780 | 3917 |  |  | 48 |
| 49 | 072 |  |  |  |  |  |  |  | 05 | $48^{\circ}$ | 9.48 | 50 | 517 | 53 | 545 | 55 | 5734 | 587 | 6014 | 693 | 49 |
| 50 | 0534 | 0506 | 047 | 0449 | 0421 | 0393 |  |  | 030 | 49.027 | 9.6832 | 6975 | 7117 | 726 | 7403 | 754 | 7688 | 83 | 7973 | 1 | 50 |
| 51 | 0345 | 0316 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9787 |  |  |  |
|  | 01 |  |  |  |  |  |  |  |  |  | 10.07 |  |  |  |  |  | 595 | 74 |  |  |  |
| 53 | 99 |  |  |  |  |  |  |  |  |  | 10.2 |  | 29 |  |  |  |  |  | 385 |  |  |
|  | 97 |  |  |  |  | 9624 |  |  | 9532 | 52．95 | 10 | 4 | 488 |  | 51 | 53 | 5503 | 5657 | 581 |  | 54 |
| 55 | 95 | 955 | 9525 | 9494 | 9463 | 9432 | 9401 | 93 | 9338 | 53．9307 |  | 6672 | 6829 |  | 7143 | 7300 | 7457 | 7613 | 777 |  | 55 |
| 56 | 93 | 9366 | 9335 | 9303 |  |  |  |  | 9144 | 54 | 10.8452 |  |  |  |  | 925 | 410 | 957 | 寿30 |  | 56 |
| 57 | 92 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 90 |  |  |  |  |  |  |  | 8757 | 56 | 11.23 |  |  |  |  | 52 | 3318 |  |  |  |  |
| 59 | 88 | 879 | 87 |  |  |  |  |  | 85 |  | 11.4 | 44 | 45 |  | 49 | 51 | 5272 | 5440 |  | 577 | 59 |
| 60 | 86 | 8607 | 85 | 85 |  |  | 8437 | 8403 | 8369 | 58．8335 | 11.6 | 6369 | 654 | 671 | 688 | 7054 | 7225 | 7397 | 7568 | 773 | 60 |
| 61 | 845 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 826 | 822 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1133 |  |  |  | 62 |
| 63 | 80 | 803 |  |  |  |  |  |  |  | 6177 | $12 \cdot 2$ |  |  |  |  |  |  |  | 348 |  | 63 |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 4310 |  | 4675 | 4858 | 5040 |  |  |  |  |
| 65 | 76 | 765 |  | 7584 |  |  |  |  |  | $63 \cdot 7362$ | 12. | 6067 | 6252 |  | 66 | 6809 | 6994 | 7180 |  |  | 65 |
|  | 750 | 74 |  |  |  |  |  |  |  |  |  |  |  |  |  | 8760 |  | 18 |  |  | 66 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1093 |  |  |  |
| 68 | 7126 | 708 | 705 | 7011 | 6973 | 6934 | 68 | 685 | 6818 | 66.67 | 13 |  |  | 22 | 24 | 266 | 2855 | 304 |  |  | 68 |
| 69 | 6937 |  |  |  |  |  |  |  | 6624 | 67．65 |  |  | 4022 | 42 | 44 | 461 | 480 | 500 | 52 | 54 | 69 |
| 70 | 674 |  |  |  |  |  |  |  |  | 68 |  | 768 |  |  |  |  | 676 | 696 | 71 |  | 70 |
|  | 65 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 636 | 63 | 62 | 62 |  | 6165 | 612 | 608 | 6043 | 70．600 | 13.9438 | 96 | 984 |  | 02 | 04 | 0670 | 087 | 108 | 128 | 72 |
|  | 6， |  |  |  |  |  |  |  |  | 71.580 | ． 13 | 1583 | 1791 |  |  | 241 |  | 2832 | 304 |  | 73 |
|  | 5990 | 5949 | 590 | 5865 | 5823 | 5781 | 57 | 569 | 5655 | 72.56 | 14.33 | 3522 | 3733 | 39 | 4156 | 4367 | 4578 | 4789 | 500 |  | 74 |
| 75 | 58 | 5759 | 5716 |  |  |  |  | 5504 | 5461 | 73.5 | 14.52 | 5462 | 5676 |  |  | 6318 | 653 | 6746 |  | 717 | 75 |
| 76 | 5612 |  |  |  |  |  | 53 |  |  | 105 | 14718 | 4 | 7618 |  |  | 8269 | 8485 | 8702 | 8919 |  | 76 |
|  | 542 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 78 | 5233 | 518 | 51 | 5101 | 5057 | 5013 | 496 | 4924 | 4879 | 76.483 | 15．10 | 1280 | 1503 | 172 | 194 | 2170 | 2393 | 2616 | 28 |  | 78 |
|  | 5044 |  |  |  |  |  |  |  | 686 | 77.464 |  | 220 | 4 4 |  | 析 | 412 | 4347 | 457 | 479 | 502 | 79 |
| 80 | 4854 | 480 | 4764 | 4719 | 674 | 628 | 458 | 4537 | 4492 | 44 | 15.49 | 5159 | 538 | 561 | 59 | 607 | 6300 | 652 | 675 |  | 80 |
|  | 466 | 4619 | 4574 | 4528 | 14482 |  | 439 | 344 | 4298 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 447 | 4430 | 4383 | 4337 | 4290 | 424 | 4197 | 4151 | 4104 | $80 \cdot 40$ | 15.88 | 903 | 927 | 95 | 97 | 99 | ＋2 | 0442 | 067 | 09 | 82 |
|  | 4286 | 4240 |  | 4146 |  |  |  |  |  |  |  |  | 121 |  |  | 887 | 1208 | ， | 263 |  | 83 |
| 84 | 409 | 405 | 400 | 395 | 39 | 38 | 38 | 3764 | 3716 | $82 \cdot 366$ | 16.2677 | 2917 | 3157 | 339 | 3636 | 3876 | 4116 | 4355 | 459 | 48 | 84 |
| 85 | 3908 |  |  |  |  |  | 3619 |  | 3522 | 347 | $16 \cdot 461$ | 4857 | 509 | 534 | 5584 | 582 | 6069 | 6312 | 6554 |  | 85 |
|  | 3718 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7778 |  |  |  |  | 86 |
| 87 | 352 | 348 | 3431 | 3382 | 3333 | 3283 | 3234 | 3184 | 213 | 85 | 17. | 8756 |  |  | 位 | 978 | 931 | 22 | 2433 |  |  |
| 88 | 334 | 3290 | 324 | 3191 | 3141 | 3091 | 3041 | 991 | 2941 | 86.289 | $17 \cdot 04$ | 0675 | 092 | 117 | 142 | 167 | 193 | 218 | 2433 | 26 | 88 |
|  | 315 |  |  |  |  |  | 2848 |  |  | 2696 |  | 2615 | 286 | 312 |  | 363 |  | 1 | 439 |  |  |
| 90 | 296 | 2910 | 2860 | 2809 | 2758 | 2707 | 2656 | 2604 | 2553 | 88.250 | $17 \times 429$ | 455 | 481 | 506 | 532 | 558 | 583 | 609 | 635 |  | 90 |
|  | 27 | 2721 | 2669 | 2618 | 2566 | 251 | 2463 | 411 | 359 | 89．230 | $17 \cdot 62$ | 6494 | 675 | 70 | 727 | 753 | 792 | 805 | 831 |  | 91 |
|  | 258 | ， | 980 | 27 |  | 2322 | 2078 | 2218 | 2166 | 90.21 |  | 8433 | 869 | 895 | 922 | 9 | 9746 | －00 | 027 | 05 | 92 |
|  | 239 | 2341 | 2288 | 2236 | 2183 | 2130 | 2078 | 2025 | 1972 | 91.19 | 1820 | 0373 | 2638 |  | 121 | 183 | 165 | 1965 | 223 | 2495 | 93 |
| 94 | 2204 |  | 888 |  |  |  | 1885 | 1831 | 1778 | 92．17 | 18.204 | 2312 | 2580 | 284 | 31 | 338 | 3653 | 392 | 4189 | 445 | 94 |
| 95 | 201 | 19 | 1907 |  |  | 17 | 1692 |  |  | $93 \cdot 1530$ | 18 | 4252 | 4523 | 4794 | 5065 | 5336 | 5607 | 5878 | 6149 | 6420 | 95 |
| 96 | 1825 | 151 | 17 | 663 | 1608 | 1554 |  | 1445 |  |  |  |  | 6465 |  | ， | 287 | 7561 |  |  |  | 96 |
|  | 163 | 1581 | 157 | 1472 | 1417 | 1362 | 1307 | 1251 | 1196 | 95．114 | 18.785 | 8131 | 8407 | 868 | 896 | 9238 | 9514 | 9791 | －068 | O34 | 97 |
|  | 144 | 1391 |  | 1281 |  |  | 1 | 1558 | 1002 | 96.0946 | 18172 | ＊070 | 035 | 062 | 901 | 1188 | 1468 | 1748 | 2027 | 23 | 98 |
|  | 125 | 1201 | 1146 |  | 1034 |  | 0921 | 086 | 0809 | 97.0752 | 19.1727 | 2010 | 223 | 2575 | 287 | 1188 | 3422 | 3784 | 598 |  | 99 |
| 100 | 1068 | 1012 | 0955 | 0899 | 0842 | 0785 | 0729 | 0672 | 0615 | 98.0558 | 19.3664 | 3949 | 4234 | 4520 | 4805 | 5090 | 5376 | 5661 | 5946 | 6231 | 00 |
|  | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | 46 | 45 | $44^{\prime}$ | 43 | $42^{\prime}$ | 41 | 50 | $49^{\prime}$ |  | $47^{\prime}$ | $46^{\prime}$ | $45^{\prime}$ | 44 | 43 |  | $41^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $11^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | 31 | $32^{\prime}$ | 33＇ | $34^{\prime}$ | $35^{\prime}$ | $36^{\prime}$ | 37 | $38^{\prime}$ | $39^{\prime}$ | $30^{\prime}$ | 31 | 32＇ | 33＇ | 34 | 35 | 36 | 37 | 38＇ |  |  |
|  | 9799 | 9799 | 9798 | 9798 | 9797 | 9796 | 9796 | 9795 | 9795 | 9794 | －1994 | 1997 | 1999 | 2002 | 2005 | 2008 | 20 | 2014 | 2016 | 2019 |  |
|  | 9598 | 959 |  |  | 9s | 95 | ， |  |  | 958 |  | 3993 |  |  | 4 | 40 | 4 | 4027 | 4033 |  |  |
|  | 9398 | 9396 | 9394 | 93 | 93 | 93 | 9 | 9386 | 938 | $2 \cdot 938$ | 5981 | 5990 | 5998 | 5007 | 60 | 6024 | 6032 | 6041 | 6049 |  |  |
|  | 9197 | 195 | 919 | 9190 | 188 | 9185 | 91 | 918 | 9178 | 9170 | 7975 | 79 | 7998 | 800 | 802 | 8032 | 8043 | 8055 | 8066 |  |  |
|  | 8996 | 8993 | 8990 | 88 | 85 | 8982 |  | 8976 | 8973 | $4 \cdot 897$ | ．9968 | 99 | 9997 | Po1 | 0025 | 0040 | 0054 |  | 0082 |  |  |
| 6 | 875 | 8792 | 878 | 87 | 8782 | 8778 | 877 | 8771 |  | 5.8764 | $1 \cdot 1962$ | 1979 | 1996 | 2013 | 2030 | 2048 | 2065 | 2082 | 2099 |  |  |
| 7 | 8595 | 859 |  |  | 78 | 8574 |  | 8566 |  |  | $1 \cdot 39$ | 397 |  | 40 | 4036 | 40 | 4075 | 4095 | 4115 | 4135 |  |
|  | 8394 | 8389 | 8385 | 8380 | 8375 | 8371 | 8366 | 8361 | 8357 | $7 \cdot 835$ | 59 | 59 | 59 | 601 | 60 | 606 | 6086 |  | 6132 |  |  |
|  |  |  |  |  |  | 8167 | 8162 | 8157 | 815 |  | －9943 |  | 79 | 80 | 80 | 80 | 80 | 8123 | 8148 | 8174 |  |
| 10 | 7992 | 7987 |  |  |  |  | 7958 | 7952 | 46 | 9.7940 | $1 \cdot 9937$ | 9965 | 9994 | －022 | 005 | 007 | 0108 | 0136 | 016 | 019 | 10 |
| 11 | 7792 | 77 | 7779 | 77 | 7766 | 7760 | 7753 | 7747 | 7740 | 10 | 19 | 1962 | 1993 | 2025 | 20 | 20 | 21 | 2150 | 2181 | 2213 |  |
| 12 | 759 | 75 | 75 | 7570 |  | 7556 | 7549 | 7542 |  | 11 | ． 3924 |  |  | 402 | 406 | 40 | 41 |  | 4198 |  | 12 |
| 13 | 739 |  |  |  |  | 7352 | 7345 |  |  | 12 |  |  |  | 602 | 60 | 6103 | 61 | 6177 | 6214 |  | 13 |
| 14 | 7189 | 71 | 717 | 7165 | 7157 | 7149 | 71 | 7132 |  | 13.7 | 2.7912 |  |  | 80 | 80 | 81 | 8151 |  | 8231 | 827 | 14 |
| 15 | 6989 | 6980 |  |  |  | 6945 |  |  |  | 14 | 2.9905 | 9948 |  | －033 | 0076 | 0119 | 0162 |  | 0247 |  | 15 |
| 16 | 6788 | 6779 | 6769 |  |  | 6741 | 6732 | 6723 | 6713 | 15.6702 | 3．1899 | 1944 | 1990 | 2036 | 2081 | 2127 |  | 2218 |  |  | 16 |
| 17 | 658 | 657 |  |  | 6548 | 6538 | 6528 | 6518 |  | 16 | － | 39 |  | 4038 | 40 | 41 | 4183 | 4232 | 4280 | 43 | 17 |
| 18 | 6386 | 63 |  |  | 6345 | 6334 | 24 |  |  | 17 | 5886 |  |  | 6040 | 60 | 61 | 61 |  | 6297 |  | 18 |
| 19 | 6186 | 617 | 61 |  |  |  |  |  |  |  |  |  |  | 8042 | 8097 | 81 | 8205 |  | 8313 | 8367 | 19 |
| 20 | 5985 | 5973 | 5962 | 5950 | 5938 | 5927 | 5915 | 5903 | 5892 | 19 | 3.9874 | 9931 | 9988 | ． 045 | 010 | 015 | 021 | 027 | 0330 | 038 | 20 |
| 21 | 57 | 5772 | 57 | 5748 | 5735 | 5723 | 571 | 569 | 5686 |  | $4 \cdot 186$ | 1927 | 1987 | 204 | 2107 | 21 | 2226 |  |  |  | 21 |
| 22 | 5583 |  |  |  |  |  |  |  | 188 | ， | ， 3861 | 3924 | 39 | 4049 | 41 | 41 | 4237 |  |  |  | 22 |
| 23 | 538 | 536 | 53 | 5343 | 5329 | 5316 | 5302 | 528 | 5275 | $22 \cdot 5$ | 585 | 5920 | 59 | 605 | 61 | 61 | 6248 | 6313 | 637 | 644 | 23 |
| 24 | 5182 | 51 | 51 | 5140 | 5126 | 5112 |  |  | 5070 | $23 \cdot 50$ | 4.7848 | 7917 |  | 805 | 81 | 81 | 9 | 8327 |  |  | 24 |
| 25 | 49 |  |  |  |  |  |  |  | 4865 |  |  | 9913 | 9985 | －056 | 0127 | 0198 | 9 | 0341 | 0412 | 48 | 25 |
| 26 | 478 | 4765 | 4750 | 4735 | 4720 |  | 4690 | 4674 | 4659 | $25 \cdot 464$ | 5.1836 | 1910 | 1984 | 2058 | 2132 | 2206 | 2280 | 235 | 2428 | 250 | 26 |
| 27 | 458 | 45 | 45 | 4533 | 4517 | 4501 | 4485 | 447 | 4454 |  |  |  |  |  | 41 | 42 | 4291 |  | 44 |  | 27 |
| 28 | 437 |  |  | 4330 | 4314 |  |  |  |  | 27.423 | 5823 |  | 5983 |  |  |  | 6302 | 6382 |  |  | 28 |
| 29 | 417 | 416 | 4144 | 4128 | 4111 | 4094 | 408 | 4060 | 4043 | 28.402 | 57817 | 789 | 798 | 806 | 8147 | 8230 | 8313 |  | 84 |  | 29 |
| 30 | 397 | 396 | 3943 | 3925 | 3908 | 3890 | 3873 | 3855 | 337 | 29.382 | 98 | 989 | 998 | －06 | 015 | 0238 | 032 | 04 | 0494 | 058 | 30 |
| 31 | 3777 | 3759 | 374 | 3723 |  |  |  |  |  | $30 \cdot 36$ | $6 \cdot 1804$ |  |  |  |  |  |  |  |  |  |  |
| 32 | 357 | 35 |  |  |  |  |  |  |  | 仡 |  |  |  |  |  | 42 |  |  |  |  | 32 |
| 33 | 337 | 33 | 3337 | 3318 | 3298 | 3279 | 326 |  | 3221 | 32＇32 | 6.57 | 5885 |  | 6074 |  | 62 | 6356 | 6450 | 65 |  | 33 |
| 34 | 3174 | 31 |  |  |  |  |  |  | ， | 33．29 | ． 7785 | 788 |  |  | 81 | 82 | 8366 | 8463 |  | 365 |  |
| 35 | 2974 | 29 |  |  | 2892 |  |  | 2831 | 810 | 4.2 | 6.9779 | 987 | 997 | －0 | 118 | 0278 | 037 | 047 | 057 | 067 | 35 |
| 36 | 277 | 275 | 2731 | 2710 | 2689 | 2668 | 264 | 2626 | 2605 | 35.258 | $7 \cdot 1772$ | 1875 | 1978 | 2080 | 2183 | 2285 | 2388 | 2491 | 2593 | 269 | 36 |
| 37 | 257 |  |  |  |  |  |  |  |  | $36 \cdot 23$ |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 237 | 234 |  |  |  |  |  |  | 2194 | 37 | 年 | 586 |  |  |  |  | 641 |  |  |  |  |
| 39 | 217 | 2148 | 2125 |  | 2080 | 205 | 203 |  |  | 38 |  | 786 |  |  |  |  | 8420 | 853 | 8643 | 875 | 39 |
| 40 | 1970 | 1947 | 1923 | 1900 | 1877 | 1853 | 1830 | 1807 | 1783 | 39．1760 | 7.9747 | 9861 | 9975 | －089 | 0203 | 0317 | 0431 | 0545 |  | 0773 | 40 |
| 41 | 17 | 1745 | 1722 |  |  |  |  |  |  | 40．15 |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 156 | 15 | 15 |  |  |  |  |  | 137 | $41 \cdot 13$ | 3735 |  |  |  | 42 |  | 4453 |  |  |  | 42 |
| 43 | 136 | 13 | 13 |  | 1268 | 1242 |  |  |  | 42.11 | 57 | 58 | 597 |  |  | 634 | 6463 | 658 |  |  | 43 |
| 44 | 116 |  | 1 |  |  |  |  |  |  | 43.09 |  | 7847 |  |  |  | 834 | 847 |  |  |  | 44 |
| 45 | 096 | 0940 | 0914 |  |  |  |  | 0783 |  | 44.07 | 97 |  | 99 |  |  | 03 | 048 | 6 | 0742 |  | 45 |
| 46 | 07 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 47 | 056 |  |  |  |  |  |  |  |  | $46^{\circ} 03$ |  |  |  |  |  | 4373 |  |  |  |  |  |
| 48 | 036 | 03 |  | 0280 | 0252 | 022 |  |  | 0140 | 47.01 |  | 5833 | 59 |  |  |  | 651 |  |  | 692 | 48 |
| 49 | 016 | 01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 528 |  |  |  | 9 |
| 50 | 996 | 9933 | 9904 | 9875 | 9846 | 9817 | 9788 | 9758 | 9729 | 48.9700 | 9.9684 | 9827 | 9969 | －112 | 0254 | 039 | 053 | 068 | 082 | 096 | 50 |
| 51 | 976 | 973 |  | 967 |  |  |  |  |  |  | 10.1678 |  |  |  |  |  |  |  |  |  |  |
| 52 | 956 | 95 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 936 | 93 |  |  |  |  | 9175 |  | 9113 | 51.90 | 10.56 | 58 |  | 61 |  | 6420 | 657 | 6722 | 873 |  |  |
| 54 | 9159 | 912 |  | 9065 | 903 | 9002 | 897 |  | 8907 | $52 \cdot$ |  | 78 | 79 | 81 | 82 | 84 | 8582 | 8736 | 885 |  | 5 |
| 55 | 89 |  |  |  |  |  |  |  |  | 53．8670 | $10 \cdot 96$ |  |  |  | 027 | 0436 | 0593 |  |  | 10 | 55 |
| 56 | 87 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 855 | 85 |  |  |  |  |  | 8325 | 8291 | $55 \cdot 82$ | 11 |  |  |  |  |  |  |  |  |  |  |
| 58 | 835 | 832 | 82 | 8255 |  | 818 | 8154 | 8120 | 8086 | $56 \cdot 80$ | 11.5633 |  |  |  |  |  |  |  |  |  | 58 |
| 59 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8300 | 868 |  |  |  |  | 59 |
| 60 | 795 | 7920 | 7885 | 7850 | 7815 | 778 | 7745 | 7710 | 7675 | 58.7640 | $11.962!$ | 979 |  | ＋134 | 0305 | 047 | 06 | 08 | 098 |  | 60 |
| 61 | 775 | 771 |  | 764 |  |  |  |  |  |  |  |  |  |  | 2315 |  | 2658 |  |  |  |  |
| 62 | 755 | 75 |  |  |  |  |  |  |  | 60.7 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 5781 |  |  |  |  | 6 |  |  |  |  |
| 64 | 715 | 71 | 7078 | 7040 |  |  |  |  | 685 | 62.68 | 12.75 | 771 |  |  |  |  |  |  |  |  | 64 |
| 65 | 695 | 6913 |  |  |  |  |  |  |  |  | 12.958 |  |  |  |  |  |  |  |  |  | 65 |
| 66 | 67 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 655 |  | 6472 |  |  | 635 |  | 627 |  | 65.6 | 13.35 | 37 |  | 41 |  |  | 4722 |  | 510 | 523 | 67 |
| 68 | 63 |  |  |  |  |  |  | 6071 | 6032 | $66 \cdot 59$ | 13.55 | 57 |  | 615 |  |  | 673 |  |  |  |  |
| 69 | 614 |  |  |  |  |  |  |  | 5826 | $67 \cdot 57$ |  |  |  | 11 |  |  | 875 |  |  |  | 69 |
| 70 | 594 | 590 | 5866 | 5825 | 5784 | 574 | 57 | 5662 | 5621 | 68.55 | 13.955 | 975 | 99 | 1 | 03 | 055 | 075 | 0954 | 115 | 13 | 70 |
| 71 | 57 | 57 | 5664 |  |  | 5540 | 5498 |  | 10 | 53 | 14.15 | 1758 |  |  |  |  | 2776 |  |  |  |  |
| 72 |  |  |  |  |  |  |  |  | 20 |  |  | 寿563 |  |  |  |  | 7787 |  |  |  |  |
| 73 | 536 | 5303 | 5260 | 52 | 51 | 513 | 5090 | 504 | 5004 | 71.49 | 14.55 | 574 | 595 | 616 | 63 | 657 | 6787 | 699 | 72 |  | 73 |
| 74 | 5144 | 5101 |  |  |  |  |  | 42 | 4799 |  | 14.75 | 7743 |  | 816 |  | 8587 | 879 |  |  |  | 74 |
| 75 | 49 | 4900 | 56 | 13 |  | 4725 |  |  | 4594 | 73 |  | 974 |  |  | 038 | 059 | 080 |  |  |  |  |
| 76 | 474 |  | 55 |  |  |  |  |  |  |  |  | 173 |  |  |  | 2603 |  |  |  |  |  |
| 77 | 454 | 449 | 53 | 44 | 4363 | 43 | 427 | 4228 | 4183 | 75．4138 | $15 \cdot 35$ | 373 | 395 | 417 | 43 | 461 | 483 | 50 | S2 | 548 |  |
| 78 | ， |  |  |  |  |  |  |  |  | ． 39 |  |  | 95 |  | 矿 | 6619 | 684 | ， |  |  |  |
| 79 | 4141 | 4095 | 4049 | 4003 | 3957 | 391 | 3864 | 818 | 3772 | 77.3726 | 15.750 | 7726 | 795 | 817 | 84 | 8626 | 8852 | 907 | 930 | 952 | 79 |
| 80 | 39 | 38 | 3847 | 3800 | 3754 | 3707 | 3660 | 3613 | 66 | 78．3520 | 15.9494 | 972 | 995 | －1 | 04 | 063 | 086 | 109 | 13 | 15 | 80 |
| 81 | 373 |  |  |  |  |  |  |  |  |  | $16 \cdot 14$ | 177 |  |  |  | 2642 | 288 |  |  |  |  |
| 82 | 353 |  | 3443 | 31 | 31 |  |  |  | 2156 | 80.31 | 16.34 | 年1919 |  | 41818 | 417 | 465 | 480 | 118 |  |  |  |
| 83 | 333 | 32 | 3241 | 31 | 31 | 3096 | 3047 | 2999 | 2950 | 81.290 | $16 \cdot 547$ | 571 | 59 | 618 | 642 | 665 | 685 | 713 | 736 | 76 | 83 |
| 84 | 析 |  |  |  |  |  |  |  | 275 | 269 |  | 7709 | 948 | 187 | 827 | 866 | 890 | 14 |  |  | 84 |
| 85 | 2936 | 2887 | 37 | 2788 | 2738 | 268 | 2639 | 2589 | 2539 | ． 24 | 16.946 | 970 | 99 |  | 043 | 067 | 091 | 115 | 140 |  |  |
| 86 | 2735 | 2685 | 35 | 2585 | 2535 | 2485 | 2435 | 2384 | 334 | 84：228 | $17 \cdot 145$ | 1702 | 194 | 219 | 24 | 268 | 2927 | 317 | 3417 | 562 | 86 |
| 87 | 2534 | 2484 | 漖 | 2383 | 咗 | 28 | 2230 | 2180 | 2129 | $85 \cdot 2077$ | 17.345 | 369 | 394 | 41 | 44 | 469 | 4938 | 518 | 543 |  | 87 |
| 88 | 2334 | 2283 | 2232 | 2180 | 212 | 207 |  | 177 | 1923 |  | 17 | 569 | 594 | 618 | 64 | 669 | 694 | 7181 |  |  | 88 |
| 89 | 2133 | 288 | 2030 | 1 | 1926 | 1874 | 22 | 1770 | 1718 | $87 \cdot 1665$ | 17.7437 | 769 | 794 | 819 | 84 | 870 | 895 | 921 | 946 | 972 | 89 |
| O | 193 | 1880 | 1828 | 1775 | 172 | 1670 | 1618 | 1565 | 151 | 88.1459 | 17.9431 | 9688 | 994 | 20 | 45 | 071 | 097 | 122 | 163 | 173 | 90 |
| 91 | 1731 |  |  |  | 1 |  |  |  | 1307 |  |  | 1684 |  | 203 |  |  |  | 2 |  |  |  |
| 92 | 1531 | 1477 | 1424 | 137 | 131 | 126 | 1209 | 1155 | 1101 | 90．104 | 18.341 | 368 | 3943 | 420 | 446 | 4730 | 4992 | 525 | 55 | 577 | 92 |
| 93 | 1330 | 1276 | 122 | 168 | 117 | 1253 | ， | 0951 | 0896 | 91.084 | 18.5412 | 5677 | 5942 | 620 | 6472 | 673 | 7002 | 726 | 753 |  | 93 |
| 94 | 1129 | 1075 |  |  | 091 | 085 | 080 | 746 | 0691 | 92．0635 | 18.7406 | 7674 | 794 | 821 | 84 | 8745 | 9013 | 928 | 954 |  | 94 |
| 95 | 0928 | 0873 |  |  | 070 | 06 | 0596 | 0541 | 85 | 93.0429 | 18.9400 | 967 | 994 | －21 | 0483 | 0753 | 1024 | 129 | 156 | 183 | 95 |
| 6 | 0728 | 047 | 0616 |  |  | 0448 | 0392 | 336 | 80 | 94.02 | $19 \cdot 1393$ | 1667 | 19 | 22 | 2488 | 2761 | 3035 | 3308 | 3582 |  | 96 |
| 9 | 05 | 04 | 0414 | O1 | 0301 | 0245 | 0188 | 0131 | 0074 | 95.001 | 19.338 | 3663 | 3940 | 4216 | 64 | 476 | 70 | 532 | 5598 |  | 97 |
| 9 | 0326 | 0269 | 0212 | 0155 | 0098 | －041 | 9984 | 9926 | 9869 | 95.981 | 19.538 | 566 | 5939 | 621 | 64 | 677 | 70 | 733 | 7615 | 789 | 98 |
|  | 0125 | 9687 | 09 | 975 | 969 | 9837 | 9779 | 9722 | 9664 | 96.960 | 19.7374 | 7656 | 7939 | 3221 | 8503 | 8785 | 9067 | 9349 | 9631 | 析 | 99 |
| 100 | 9925 | 9867 | 309 | 9750 | 9692 | 9634 | 9575 | 9517 | 458 | 97.939 | 19.9368 | 9653 | 9938 | ＋223 | 0508 | 0793 | 1078 | 1363 | 1648 | 93 | 100 |
|  | $3{ }^{\prime}$ | 29 | $28^{\prime}$ | $27^{\prime}$ | 26 | 25 | 24 | 23 | 22 | $21^{\prime}$ | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | 96＇ | $25^{\prime}$ | 24 | $23^{\prime}$ |  | $21^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| 11 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $11^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | 58 | $59^{\prime}$ | $50^{\prime}$ | 51 | 52 | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | $58^{\prime}$ | $59^{\prime}$ |  |
|  | 9787 | 19787 | 9786 | 978 | 97 | 9784 | 9784 | 9783 | 9783 | 9782 | 2051 | 2054 | 20 | 20 | 2062 | 2065 | 2068 | 2071 | 2073 |  |  |
|  | 9575 | 9574 | 9573 | 957 | 953 | 95 | 95 | 95 | 956 | 956 | 410 | 4107 | 4113 | 4118 | 4124 | 4130 | 413 | 414 | 4 | 4153 |  |
|  | 9362 | 936 | 935 | 935 | 9355 | 935 | 935 | 93 | 9348 | 2.9 | 152 | 6161 | 6169 | 6178 | 61 | 61 | 6203 | 6212 |  | 62 |  |
|  | 9150 | 9148 | 9145 | 9143 | 91 | 9138 | 9136 | 9133 | 9131 | 3.912 | 203 | 8214 | 8225 | 8237 | 8248 | 826 | 827 | 828 | 8294 | 83 |  |
|  | 893 |  | 8931 | 8928 | 8925 | 892 | 8919 | － | 8913 | －8910 | ． 0253 | 0268 | 0282 | 0296 | 0310 | 032 | 033 | 035 | 0367 | 038 |  |
| 6 | 87 | 8721 | 8718 | 8714 | 8711 | 8707 | 8703 |  | 8696 | 5.8692 | 1.2304 | 2321 | 2338 | 2355 | 2372 | 2389 | 2406 | 2423 |  |  |  |
|  | 851 | 850 | 850 | 850 | 849 | 849 | 84 |  | 847 | 8， |  | 43 | 43 | 4414 | 443 | 4454 | 4474 | 4494 | 4514 | 453 |  |
|  | 830 | 829 | 8290 | 8286 | 8281 | 827 | 827 |  | 826 | 825 | ． 6405 | 64 | 645 | 647 | 649 | 65 | 65 | 65 | 6587 | 6610 |  |
|  | 808 | 808 | 807 | 71 | 8066 | 806 | 805 | 8050 | 8044 |  |  | 84 | 8507 | 85 | 85 | 8584 | 8610 | － 7 | 8661 | 8686 |  |
| 10 | 7875 | 7869 | 7863 | 7857 | 7851 | 7845 | 7839 | 7833 | 7827 | 9.7821 | ． 0507 | 0535 | 0563 | 0592 | 0620 | 064 | 067 | 070 | 0734 | 076 | 10 |
| 11 | 7662 | 7656 | 7649 | 7643 | 36 | 76 | 7623 | 7616 | 7610 | 10 | 2.2557 | 25 | 26 | 26 | 2682 | 27 | 2745 | 2776 | 2808 | 2839 |  |
| 12 | 745 |  |  |  | ， | 7414 | 74 | 7399 | 7392 | 11.73 | 4608 | 46 | 46 | 4710 | 474 | 477 | 48 | 48 | 4881 |  | 2 |
| 13 | 7237 | 723 | 7222 | 7214 | 7206 | 7198 | 719 | 7183 | 71 | 12.7 | ． 6659 | 6696 | 67 | 6770 | 6807 | 68 | 68 | 6918 | 6955 | 699 |  |
| 14 | 7025 |  | － |  | 677 | 6983 | 697 |  | 6958 | 13.694 | $2 \cdot 8709$ |  | 8789 | 8829 | 886 | 8908 | 89 | 89 | 9028 | 906 | 4 |
| 15 | 681 | 6803 |  | 85 | 6776 | 6767 |  |  |  | 14.673 |  |  |  | 0888 | 03 | 097 | 10 | 1059 | 1101 | 1144 | 15 |
| 16 | 660 | 65 | 6581 | 6571 | 6561 | 6552 | 6542 | 6533 | 6523 | 15.651 | 3.2810 | 2856 | 2902 | 2947 | 299 | 3038 | 3084 |  |  | 3220 | 16 |
| 17 | 638 | 637 | 636 | 635 | 634 | 63 | 63 | 63 | 630 | 16.6 | 4861 | 49 | 49 | 5006 | 5055 | 5103 | 51 | 520 | 48 | 5297 | 7 |
| 18 | 6175 | 616 | 6153 |  | 6132 | 612 | 611 |  | 6088 | 17. | 9912 | 6963 | 70 | 70 | 7117 | 71 | 72 | 72 | 7322 |  | 18 |
| 19 | 596 | 59 | 593 | 59 | 5917 | 5905 | 5894 | 5882 | 5871 | 18.5 | $3 \cdot 8962$ | 9017 | 9071 | 91 | 91 | 9233 | 928 |  | 9395 |  | 19 |
| 20 | 5750 | 57 | 5726 | 5714 | 5702 | 569 | 5678 | 5666 | 5654 | 19.564 | 1013 | 107 | 112 | 1184 | 1241 | 129 | 135 | 141 | 146 | 152 | 20 |
| 21 | 55 |  |  |  |  |  |  |  |  | 20.54 | $4 \cdot 3064$ |  | 3183 | 324 | 330 | 33 | 34 | 34 | 35 | 3602 | 1 |
| 22 | 532 | 53 | 52 | 5285 | 527 | 52 | 52 |  |  | 21.52 | 5114 |  | 52 | 5302 | 5365 | 5428 |  | 5553 | ， | 67 | 2 |
| 23 | 511 | 50 | 50 | 5071 | 50 | 504 | 50 | 5016 | 5002 | 2.49 | ． 7165 | 72 | 72 | 7361 | 74 | 7492 | 75 | 762 | 7689 | 7754 | 23 |
| 24 | 490 |  |  |  | 4842 | 4828 | 48 |  | 4784 | $3 \cdot 477$ | －9216 | 92 | 9352 | 9421 | 488 | 955 | 962 | 96 | 22 | 983 |  |
| 25 | 4687 | 4672 | 465 | 642 | 4627 | 4612 | 4597 | 45 | 4567 | 4455 |  | 1338 | 1409 | 48 | 55 | 162 | 169 | 176 | 1836 | 90 | 25 |
| 26 | 447 | 4459 | 4443 | 4428 | 4412 | 4397 | 4381 | 4365 | 4350 | $25 \cdot 4334$ | 5.3317 | 3391 | 3465 | 3539 | 3613 | 3687 | 376 | 383 | 3909 | 3983 | 26 |
| 27 | 4262 | 42 | 42 | 4214 | 4197 | 4181 |  | 4149 | 4132 | ， | 5368 |  |  |  | 5675 | 57 | 582 |  |  |  | 27 |
| 28 | 405 | 403 | 40 | 3999 | 3983 | 39 | 39 |  |  | $27 \cdot 38$ | 7418 |  | 75 | 7657 | 77 | 781 | 789 | 797 | 3056 |  | 28 |
| 29 | 383 | 38 | 3802 | 3785 | 3768 | 37 | 3733 |  |  | 28.368 | ．9469 | 95 | 9634 | 9717 | 979 | 9882 | 996 | ＋0 | 29 | 021 | 29 |
| 30 | 3624 | 3607 |  | 3571 | 3553 | 3535 | 3517 | 3499 | 3481 | 9.346 | 1520 | 160 | 1690 | 1776 | 186 | 194 | 203 | 211 | 2203 | 228 | 30 |
| 31 | 341 | 33 |  | 3356 |  | 3319 |  |  |  |  | 6.3570 | 3659 |  |  |  |  |  |  |  |  |  |
| 32 | 319 | 318 | 316 | 314 | 3123 | 310 | 30 | 30 | 304 | 31.30 | ． 5621 | 57 |  |  | 598 |  |  | 62 |  |  |  |
| 33 | 298 | 2967 | 29 | 2928 | 2908 | 2888 |  |  |  | 28 | ． 76 |  | 7860 |  | 80 | 81 | 82 | 83 | 84 | 85 |  |
| 34 | 277 | 27 |  |  |  | 267 | 26 |  |  | 3.25 | ． 97 | 98 | 99 | －013 | 010 | 020 | 030 |  | 0496 | 059 |  |
| 35 | 256 | 25 | 25 | 2499 | 78 | 2457 | 24 | 2415 | 2394 | 34.23 | －1773 | 1873 | 1972 | 2072 | 217 | 227 | 237 | 2470 | 2570 | 267 | 35 |
| 36 | 2349 | 2328 | 2306 | 2285 | 2263 | 2242 | 2220 | 2198 | 2177 | 35.2155 | 7.3824 | 3926 | 4029 | 4131 | 4234 | 4336 | 4438 | 4541 | 4643 | 4746 | 36 |
| 37 | 213 |  |  |  |  |  |  |  |  |  | 58 |  |  |  | 629 | 64 |  |  |  |  |  |
| 38 | 192 | 1902 | 1879 | 1856 | 1833 | 18 | 17 | 17 | 1742 | $37 \cdot 1$ | －7925 | 803 |  | 82 | 835 | 84 | 85 | 868 | 8790 | 88 |  |
| 39 | 1712 |  | 1665 | 1642 | 1619 | 1595 | 15 |  | 1525 | 38.150 | 99 |  |  | 0309 | 042 | 05 | 06 | 0753 | 0864 | 097 |  |
| 40 | 149 | 147 | 145 |  | 1404 | 1380 | 1356 | 133 | 1307 | 39•1283 | 8.2026 | 2140 | 2254 | 236 | 248 | 259 | 27 | 2823 | 2937 | 305 | 40 |
| 41 | 128 | 1262 | 1238 |  |  |  |  |  |  | 40．106 | 4077 |  |  |  |  |  |  |  |  |  |  |
| 42 | 107 | 1049 | 1024 |  | 0974 |  | 0923 |  |  |  | 61 |  |  |  |  | 672 | 68 | 69 | 4 |  |  |
| 43 | 086 | 08 | 0810 | 07 | ， | 07 | 0707 |  | 0655 | ． 06 | 817 | 83 | 84 |  | 866 | 87 | 891 | 90 | 915 | 9280 |  |
| 44 | 064 | 062 | 0597 |  | 0544 | 05 | 04 | 04 | 0438 |  | 22 | 03 | 04 | 06 | 073 | 085 | 098 | 106 | 123 | 1356 |  |
| 45 | 043 | 041 | 0383 | 0356 | 0329 | 0302 | 0275 | 02 | 02 | 44.019 | 22 | 24 |  | d | 279 | 292 | 304 | 317 | 330 | 343 | 45 |
| 46 | 0224 | 0197 |  | 0142 | 0114 | 0087 |  |  |  | 44．997 | $0 \cdot 433$ |  |  | 4723 | 4854 |  | 5116 | 5247 | 5378 |  |  |
| 47 | －01 | 99 |  | 9927 | 9899 | 9871 | 9827 |  |  | $45 \cdot 97$ | 析 |  |  | 6782 |  |  | 7183 |  |  |  |  |
| 48 | 979 | 97 | 97 |  |  | 9656 | 9627 | 959 |  | 46 | 9.843 |  |  | 884 | 89 | 91 | 92 | 93 | 95 | 96 |  |
| 49 | 958 | 9557 | 9528 |  | 9469 | 440 | 9411 | 9381 | 9352 | 7.932 | ． 04 | 06 |  | 09 | 104 | 118 | 131 | 145 | 15 | 17 | 9 |
| 50 | 937 | 934 | 9314 | 9284 | 9255 | 25 | 9194 | 9164 | 91 | 48.910 | 0.25 | 2675 | 28 | 296 | 3102 | 3244 | 3387 | 352 | 3671 | 381 | 50 |
| 51 | 91 | 9131 | 910 |  |  |  |  | 8948 | 891 |  | 45 | 47 | 48 | 501 | 51 |  |  | 56 |  |  |  |
| 52 | 89 | 89 |  |  | 8825 | 8793 | 8762 | 8731 |  | 50：866 | 10 |  |  |  |  |  |  |  |  |  |  |
| 53 | 873 | 87 | 867 | 86 | 8610 | 8578 | 8546 | 85 | 8482 | 51 | 10 |  |  | 91 | 928 | 9439 |  |  | 9892 | ＋04 |  |
| 54 | 852 | 84 |  | 84 | 8395 | 8362 | 833 | 82 |  |  | 11.07 | 08 | 10 | 11 | 1350 | 150 | 1658 | 181 | 19 | 21 |  |
| 55 | 831 | 8279 | 8246 | 8213 | 8180 | 8147 | 8114 | 8081 | 8048 | 53.801 | $11 \cdot 278$ | 29 | 309 | 3256 | 3412 | 3569 | 3725 | 388 | 40 | 419 | 55 |
| 56 | 80 | 8066 | 8032 | 7999 | 7965 | 7931 | 7898 |  |  |  | 11.4837 |  |  |  | 5474 |  |  |  |  |  |  |
| 57 | 788 | 785 | 78 | 77 | 7750 | 7716 | 76 |  | 76 | 55.7 | 11.6887 | 7050 | 72 | 7374 | 75 |  | 789 |  |  |  |  |
|  | 767 |  |  |  |  | 7500 | 746 |  | 7396 | 56.73 | 11.8 | 9103 | 92 | 9433 | 95 |  | 99 | －0 | 0259 | 04 |  |
| 59 | 7461 | 742 | 73 | 7356 | 7320 | 285 | 249 | 7214 | 7178 | 57.71 | 12.09 |  | 13 | 14 | 16 | 182 | 199 | 216 |  |  |  |
| 60 | 724 | 721 | 7177 | 7141 | 7105 | 7069 | 33 | 6997 | 696 | 58.692 | 12.303 | 321 | 3381 | 355 | 3723 | 389 | 406 | 423 | 4406 | 457 | 60 |
| 61 | 703 |  |  |  |  |  | 68 |  |  | 59．670 | 12.509 | 526 |  | 561 | 578 |  |  | 63 |  |  |  |
|  | 682 |  |  |  |  |  | 6601 |  |  | 6 |  |  |  |  |  | 802 |  |  |  |  |  |
| 63 | 661 | 657 | 653 | 64 | 646 | 642 | 6385 | 63 | 63 | 61.62 | 12 | 93 | 955 | 97 | 990 | －1 |  |  |  |  |  |
| 64 | 6399 |  |  |  |  | 6207 |  |  |  | $62 \cdot 60$ | $13 \cdot 1242$ | 1424 | 析 | 178 | 197 | 21 |  |  |  | 28 | 64 |
| 65 | 618 | 614 |  | 60 | 6031 | 992 | 5953 |  | 5874 |  | $13 \cdot 3293$ | 3478 |  |  |  | 213 |  |  | 269 | 49 | 65 |
| 66 | 5974 | 59 | 589 | 5851 | 5816 | 577 | 5737 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 576 | 57 | 56 | 56 | 5381 | 5561 | 55 | 54 | 544 | 65.53 | 13.73 | 75 | 777 |  | 815 | 83 | 85 | 87 | 89 |  | 67 |
| 68 | 554 |  |  |  |  |  |  |  |  |  |  |  |  |  | 219 | 24 |  |  | 硡 |  | 68 |
| 69 | 5336 | 529 | 52 | 52 | 517 | 5130 | 5088 | 504 | 50 | $67 \times 49$ | 14.149 | 169 | 188 | 2 | 228 | 2477 | 267 | 287 | 306 |  | 69 |
| 70 | 5124 | 5082 |  | 4998 | 49 | 49 | 4872 | 4830 | 4788 | 68.474 | $14 \cdot 35$ | 3745 | 3944 | 4144 | 4343 | 45 | 4741 | 49 | 514 | 533 | 70 |
| 71 | 4911 |  |  |  |  |  | 4656 |  | 4571 |  | 14.75 |  |  |  | 6405 | 6607 | 68 | ， | 72 |  |  |
| 72 | 4699 | 4656 | 4613 | 4570 | 4526 | 44 | 4440 | 439 | 4353 |  |  |  |  |  |  | 867 |  | 908 |  |  | 72 |
| 73 | 4486 | 44 | 43 | 43 | 43 | 42 | 4224 | 418 | 4136 | 71.409 | 14.969 | 990 | －113 | 032 | 052 | 073 | 094 | 115 | 136 | 156 | 73 |
| 74 | 4274 |  |  | 41 |  | 4052 | 4008 |  | 3919 | 38 | 1748 | 959 | 217 | 238 | 259 | 280 | 301 | 322 | 343 | 36 | 74 |
| 75 | 4061 | 4016 | 3972 | 3927 | 3882 | 3837 | 3792 | 374 | 3701 | $73 \cdot 365$ | 15.3799 | 201 | 12 |  | 465 | 486 | 508 | 1152 |  |  | 75 |
| 76 | 3849 | 380 | 37 | 37 | 3667 | 362 | 3576 | 3530 | 3484 | 74 | 15 | 60 | 628 | 649 | 67 | 693 | 疗 |  |  |  |  |
| 77 | 3636 | 3590 |  | 3498 | S 32 | 3406 | 3359 | 3313 | 3267 | $75 \cdot 322$ | 15790 | 812 | 83 | 855 | 8771 | 899 | 92 | 9435 | 965 | 987 | 77 |
| 78 | 3424 | 3377 | 3330 | 3284 | 3237 | 3190 | 3143 | 309 | 304 |  |  |  |  |  |  | 1061 | 128 | 5056 | 172 | 19 | 78 |
| 79 | 3211 | 3164 | 31 | 3069 | 302 | 2975 | 2927 | 2880 | 2832 | $77 \cdot 2784$ | $16 \cdot 2002$ | 2227 | 2452 | 2676 | 2901 | 3126 | 3351 | 3576 | 380 | 402 | 79 |
| 80 | 29 | 2951 |  | 2855 | 2807 | 2759 | 2711 | 2663 | 2615 | 78.2566 | 16.4052 | 428 | 450 | 4736 | 49 | 519 | 541 | 56 | 58 | 6102 | 80 |
| 81 | 27 | 27 |  |  |  |  |  |  | 2970 |  |  |  |  |  |  |  |  | \％188 |  |  |  |
| 82 | 2574 | 2525 | 247 | 2426 | 237 | 2328 | 2279 | 2230 | 2180 | 80.2131 | 16.8154 | 838 | 862 | 885 | 1 | 932 | 955 | 978 | ＋21 | 253 | 82 |
| 83 | 2361 | 251 | 276 | 析 | 1 | 2113 | 2063 | 2013 | 1963 | 81．1913 | 17.0204 | 044 | 0677 | 0913 | 1149 | 1386 | 1622 | 1858 | 209 | 23 | 83 |
| 84 | 2149 | 2098 | 2048 | 1998 | 1948 | 1897 | 1847 | 1796 | 1745 | $82 \cdot 169$ | 225 | 249 | 273 | 2972 | 3212 | 345 | 369 | 392 | 416 | 440 | 84 |
| 85 | 19 | 1885 | 1834 | 17 | 1733 | 16 | 1631 | 1579 | 1528 | $83 \cdot 1477$ | 433 | 454 | 479 | 503 | 5274 | 551 | 575 | 599 |  |  | 85 |
| 86 | 17 | 167 | 162 | 15 | 1518 | 1466 | 1414 | 1363 | 1311 | 84.1259 | 17.635 | 6601 | 6846 | 709 | 7336 | 7580 | 782 | 8070 | 83 |  | 86 |
| 87 | 151 | 145 | 140 | 135 | 108 | 1251 | 198 | 1146 | 1094 | 85.1041 | 17.840 | 8655 | 8902 | 9150 | 939 | 9645 | 989 | ＋14 | 038 |  | 87 |
| 88 | 129 | 124 | 119 | 114 | 108 | 1035 | 0982 | 0929 | 0876 | 86.082 | 18.0458 | 0708 | 0959 | 1209 | 1460 | 1710 | 961 | 22 | 246 | 27 | 88 |
| 89 | 1086 | 033 | 0980 | 0926 | 0873 | 0820 | 0766 | 0713 | 0659 | 87.060 | 18.2508 | 2762 | 3015 | 3268 | 35 | 3775 | 4028 | 4282 | 453 |  | 89 |
| 90 | 0873 | 0820 | 0766 | 0712 | 0658 | 0604 | 0550 | 0496 | 0442 | 88.038 | 18.4559 | 4815 | 5071 | 5328 | 3522 |  | 6096 | 6352 | 6608 | 47 | 90 |
| 91 | 06 | 060 | 0552 | 0498 | 0443 | 0389 | 0334 | 0279 | 0224 | 80．993 |  | 6869 | 712 | 738 |  | 9970 |  |  |  |  |  |
| 92 | 0448 | 0394 | 0338 | 0283 | 28 | 0173 | 0118 | 0062 | －007 | 89.995 | 18.8660 | 8922 | 9184 | 9446 | 9708 | 997 | －232 | 0493 | 075 | （01 | 92 |
| 93 | 023 | 0180 | 0125 | 0069 | 1013 | 9958 | 902 | 9846 | 9790 | 90.973 | 19.0711 | 0976 | 1240 | 1505 | 1770 | 2035 | 2299 | 2564 | 2829 | 3093 | 93 |
| 94 | －023 | 9967 | 9911 | 9855 | 9 | 42 | 9686 | 9629 | 9572 | 91.9516 | $19 \cdot 2762$ | 3029 | 3297 | 3564 | 3832 | 4099 | 4367 | 4635 | 4902 | 517 | 94 |
| 95 | $\frac{9811}{9598}$ | 975 | 9484 | 9426 | 9369 | 9527 | 9469 | 412 | 9355 | 92．9298 | 19．4812 | 5083 | 5353 | 562 | 589 | 61 | 6435 | 6705 | 6975 | 724 | 95 |
| 96 | 9598 | 9541 |  | 9426 9212 | 9369 | 9311 | 9253 | 9196 | 9138 | 93．908 | 19＊6863 | 7136 | 7410 | 7683 | 7956 | 8229 | 3502 | 8776 | 9049 | 932 | 96 |
| 97 | 9386 | 9328 | 9270 | 9212 | 9154 | 9096 | 9037 | 8979 | 8920 | 94．8862 | 19.8914 | 9190 | 9466 | 9742 | －0 | 029 | 0570 | 0846 | 1122 | 139 | 97 |
| 98 | 9173 | 9115 | 9056 8843 | 8998 8783 | 89 | 8880 | 8821 | 8762 | 8703 | $95 \cdot 8644$ | 20．0964 | 1243 | 1522 | 180 |  | 23 | 2638 | 2917 | 3196 | 3475 | 98 |
|  | 896 | 8902 | 8843 8629 | 8783 8569 | 8509 | 8665 | 8605 | 8545 | 8486 | 96．8426 | $20 \cdot 3015$ | 3297 | 3579 | 3860 | 4142 | 4424 | 4706 | 4987 | 5269 | 555 | 99 |
| 100 | 8748 | 8689 | 8629 | 8569 | 8509 | 8449 | 8389 | 8329 | 8268 | 97．8208 | $20 \cdot 5066$ | 5350 | 5635 | 5920 | 6204 | 6489 | 6773 | 7058 | 343 | 627 | 00 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2{ }^{\prime}$ | $1^{\prime}$ | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{1}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ |  | $1^{\prime}$ |  |
| 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | NE． |  |  |  |  | $8^{\circ}$ |

TRAVERSE TABLES.


# TRAVERSE TABLES． 

|  | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $12^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | 11 | 12 | 13＇ | $14^{\prime}$ | $1{ }^{\prime}$ | 16 |  | $18^{\prime}$ |  |  | $11^{\prime}$ | $12^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ |  |  |  |  |
|  | 9775 | 977 | 977 | 97 | 97 | 97 | 977 | 977 | 97 | 9770 | 2108 | 2110 |  | 211 | 2119 | 21 |  | 2127 |  |  |  |
|  | 55 | 955 | 954 |  | 95 | 95 | 95 | 9542 |  | 1.95 | 215 | 42 | 42 | 4232 | 4238 | 42 | 4249 | 4255 | 42 |  |  |
|  | 9326 | 9324 | 9322 | 9321 | 9319 | 93 | 9315 | 9313 | 93 | 2.93 | 323 | 633 | 634 | 6348 | 6357 | 6365 | 63 | 638 | 6391 |  |  |
|  | 9102 | 909 | 90 |  | 90 | 90 | 9087 | 9084 | 90 |  | 330 | 8442 | 8453 | 8464 | 8476 | 8487 | 8498 | 8510 |  | 8533 |  |
|  | 8877 | 8874 | 8871 | 8868 | 8865 | 88 | 8858 | 55 | 8852 | 4.8849 | －0538 | 0552 | 0566 | 0580 | 0595 | 065 |  | 0637 | 0652 |  |  |
|  | 865 | 864 | 8645 | 8641 | 8638 | 8634 | 8630 | 8626 | 8623 | 5.8619 | ． 2645 | 2662 | 267 | 2697 | 2714 | 2731 | 2748 | 27 | 2782 | 2799 |  |
|  | 84 | 8423 | 8419 | 84 | 84 |  | 84 |  | 83 |  |  | 47 | 479 | 48 | 4833 | 485 | 4872 | 48 | 2 | 4932 |  |
|  | 820 | 8198 |  |  | 81 |  | 817 | 8169 | 816 | $7 \cdot 815$ | 860 | 688 | 6906 | 6929 | 6951 | 6974 | 6997 | 7020 | 2 | 7065 |  |
|  | 797 | 7973 | 77 | 79 | 795 | 795 | 774 | 7940 | 79 | 8.792 | ． 8968 | 89 | 90 | 9045 | 9070 | 909 | 91 | 91 | 173 | 919 |  |
| 10 | 775 | 774 | 7742 |  | 752 | 7723 | 717 | 7711 | 7705 | 9.7698 | 76 | 110 | 113 | 11 |  | 1218 | 124 | 127 | 1303 | 1331 | 10 |
| 11 | 752 | 75 | 7516 |  |  |  |  |  |  |  | 2.3183 | 3214 | 3246 | 327 | 3308 | 3340 |  |  |  |  |  |
| 12 | 730 | 729 | 729 | 728 |  |  |  |  |  |  |  | 5325 | 5359 | 5393 | 427 |  |  |  |  |  |  |
| 13 | 7080 | 7072 | 70 | 70 | 70 | 70 | 7032 | 702 | 70 | 12.70 | 2.7398 | 743 | 74 | 75 | 7546 | 7583 | 76 | 7657 | 4 | 73 | 13 |
|  | 685 | 684 |  | 68 |  |  |  | 67 | 6786 | 13.67 |  | 954 | 9585 | 9625 | 9665 | 970 | 974 | 978 | 9824 | 986 |  |
| 15 | 6631 | 6622 | 6612 | 6603 | 65 | 6585 | 6575 | 6566 | 557 | 仡 | 3．1613 | 165 | 1699 | 1741 | 1784 | 1827 | 1869 | 191 | 1955 | 1997 | 15 |
| 16 | 640 | 639 | 6387 | 63 | 6367 | 6357 | 6347 | 6337 | 6327 | 15.6317 | 3.3721 | 3766 | 3812 | 3857 | 3903 | 3948 | 399 | 403 | 4085 | 4130 | 16 |
| 17 | 6182 | 6171 | 6161 | 6150 |  |  | 6119 | 6108 | 609 | 16 |  | 58 | 59 | 597 | 6022 | 607 | 611 | 6167 |  |  | 17 |
| 18 | 595 | 59 | 5935 | 59 | 5913 |  |  | 58 | 586 | 17.58 | 7936 |  | 80 | 80 | 81 | 81 | 824 | 1 | 215 | 8397 | 18 |
| 19 | 573 | 57 | 57 | 5697 | 568 |  |  | 5650 | 563 | 18.5 | 4.0044 | 00 | 01 | 0206 | 0260 | 0314 | 0368 | 042 | 6 | 0530 | 19 |
| 20 | 5508 |  |  | 54 |  |  | 5434 | 5422 | 5409 | 19.539 | 2151 | 2208 | 22 | 23 | 2379 | 243 | 249 | 25 | 06 | 2663 | $\underline{20}$ |
| 21 | 5283 | 5270 | 5257 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 22 | 505 | 50 | 503 | 50 | 50 |  |  |  | 4950 | $21 \cdot 4$ |  | 6429 |  |  |  |  |  |  |  |  |  |
| 23 | 483 | 4820 | 4806 | 4792 | 47 |  | 4749 | 4735 | 4720 | 22.4 | 4.8474 | 85 | 8605 | 86 | 87 | 88 | 88 | 8 | 899 | 9062 | 23 |
| 24 | 460 | 4595 | 4580 | 4565 | 45 |  | 4521 |  | 44 | 23.4 | 5.05 | 065 | 0718 | 07 | 0854 | 09 | 09 | 105 | 1127 |  |  |
| 25 | 438 | 436 | 4354 | 4339 | 4323 | 430 | 4292 | 4277 | 26 | 24.4 | $5 \cdot 2689$ | 2760 | 2831 | 2902 | 973 | 304 | 311 | 318 | 3258 | 3329 | 25 |
| 26 | 41 | 41 | 4128 | 4112 | 4096 | 4080 | 4064 | 4048 | 4032 | 25.4016 | 5．479 | 4871 | 4944 | 5018 | 5092 | 5166 | 524 | 5314 | 5388 | 5462 | 26 |
|  |  |  |  |  |  |  |  |  |  | 26 | 5.69 | 698 |  |  |  |  | 736 |  |  |  | 27 |
| 28 | 371 | 36 | 3676 | 36 | 3642 | 3625 |  | 3590 | 35 | 27.3 | 5.90 | 909 |  |  | 9330 |  |  |  |  |  |  |
| 29 | 34 |  |  | 3433 |  |  |  | 3361 | 33 | 28 | 6.1119 | 120 | 1284 | 1367 | 1449 | 153 | 1614 | 169 | 1779 | 1861 |  |
| 30 | 326 |  | 3225 | 320 | 3188 |  |  | 3132 | 3114 | 29.309 | 6．3227 | 331 | 3397 | 348 | 356 | 365 | 373 | 382 | 39 | 399 | 30 |
| 31 | 3037 |  |  |  |  |  |  |  |  |  | 6.53 |  |  |  |  |  |  |  |  |  |  |
| 32 | 281 | 2793 | 27 | 27 | 27 | 271 | 269 | 267 | 26 | 31－26 |  |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 258 |  | 25 | 25 | 25 |  |  | 2445 | 24 | 32 | 6.95 | 96 | 97 |  |  | －019 | 0112 | 020 | 0300 | 039 | 33 |
| 3 | 236 |  | 2 |  |  |  |  | 砣 | 2196 | 33．21 | $7 \cdot 165$ |  | 185 | 19 | 204 | 21 | 223 | 23 | 2430 | 252 |  |
| 35 | 213 | 21 | 2096 | 2074 | 2052 | 2031 |  | 88 | 1966 | 34．19 | 3765 |  |  |  |  | 426 | 236 | 446 | 456 | 66 |  |
| 36 | 1914 | 1892 | 1870 | 1848 | 1825 | 1803 | 178 | 1759 | 1736 | 35．1714 | 7.5872 | 597 | 607 | 617 | 6282 | 6384 | 6486 | 658 |  | 6793 | 36 |
|  | 16 |  |  | 1621 | 1598 |  |  | 1530 | 150 | 36 | 79 |  |  |  |  |  |  |  |  |  | 37 |
| 38 | 146 | 14 | 14 | 1395 | 137 | 1348 | 132 | 130 | 127 | $37 \cdot$ | 0087 | 019 |  |  |  | 062 |  |  |  |  | 38 |
| 39 | 12 | 12 | 11 | 1168 | 1144 |  |  | 1072 | 104 | 38 | 8.21 | 230 |  |  | 2638 | 274 | 286 | 297 | 2 | 3193 |  |
| 40 | 1015 | 0991 | 0966 | 0942 | 0917 |  | 0868 | 0843 | 0818 | 39.0793 | 8.4302 | 44 | 4530 | 4644 | 475 | 487 | 498 | 509 | 52 | 5326 | －40 |
| 41 | 079 | 0766 | 074 | 0715 |  |  |  | 061 | 0589 |  |  | 652 |  |  |  |  |  |  |  |  |  |
| 42 | 056 |  |  | 0489 |  |  |  |  | 03 | ， |  | 863 |  |  | 899 | 91 | 923 |  |  |  |  |
| 43 | 03 |  |  | 02 |  |  |  |  | 0 | 42.01 | 062 | 07 |  |  | 11 | 12 | 135 | 14 |  | 1725 | 43 |
| 44 | 011 | 0090 | 0063 | 0036 |  |  |  | 992 | 9900 | 42 | 733 | 285 | 29 | 31 | 32 | 33 | 348 | 360 | 3733 | 3858 | 44 |
| 45 | 98 | 9865 | 9837 |  |  |  |  |  | 9671 | 43 |  | 496 | 50 |  | 535 | 54 |  | 573 |  | 5992 | 45 |
| 46 | ｜9668 | 9640 | 9611 | 9583 | 9555 |  |  | 9469 |  |  |  |  |  |  | 7471 |  |  |  |  |  | 46 |
| 47 |  |  | 9385 | 9357 | 9328 |  |  |  | 921 |  | $9 \cdot 905$ | 918 | 932 |  | 95 | 972 |  |  |  |  | 4 |
| 48 | 92 | 91 | 91 | 91 | 910 | 90 |  | 901 | 89 |  | 10．1163 | 129 | 1436 | 15 | 170 | 184 | 198 |  |  |  | 48 |
| 49 |  |  | 89 | 8904 | 8873 |  |  |  | 8752 |  |  | 341 |  |  | 382 | 396 | 410 | 42 |  |  | 49 |
| 50 | 8769 | 8739 | 8708 | 8677 | 8646 | 8616 | 8585 | 8554 | 8523 | 48 | 10 | 5520 | 5662 | 5805 | 5 | 608 | 623 | 6373 | 6515 | 665 | 0 |
| 51 | 85 | 8513 |  | 8451 | 841 |  | 835 |  | 8293 | 49 |  | 763 |  |  |  |  |  |  |  |  | 1 |
| 5 | 83 |  |  |  |  |  | 812 |  | 80 |  |  | 974 |  | ＋035 |  | 033 | 048 | 062 |  | 923 | 52 |
| 5 |  | 80 |  | 79 | 7965 |  | 7900 |  | 783 | 51 | 11 | 18. | 200 | 215 | 23 | 245 | 260 | 275 |  |  | 53 |
| 54 | 787 | 78 |  | 7771 | 7738 | 7705 |  | 7638 |  | 5275 | 11 | 396 | 411 | 42 | 442 | 457 | 47 | 8 | 5036 |  | 54 |
| 55 | 7646 |  |  |  |  |  |  |  | 7375 | 53.73 | 11.59 | 607 | 62 |  | 654 | 669 | 685 | 701 |  | 732 | 55 |
| 56 | 7422 | 7387 | 7353 | 7318 | 7284 | 7249 |  |  |  |  | 11.80 |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 7197 |  | 71 | 7092 | 7057 |  |  |  | 6916 | 55.68 | 12 |  |  |  |  |  | 110 |  |  |  |  |
| 58 | 69 |  |  | 6866 |  |  | 67 | 6722 | 66 | 56.665 | 12. | 24 | 256 | 27 | 289 | 30 | 322 | 339 | 3558 | 372 | 58 |
| 59 |  |  | 66 |  |  |  |  |  | 64 | 57 | 12. | 4514 | 468 |  | 501 | 518 | 53 | 55 | 56 | 585 |  |
| 60 | 6523 | 6486 | 645 | 6413 | 6376 | 6339 | 630 | 626 | 6227 | 58.6190 | 12 | 624 | 6795 |  | 136 | 330 | 7477 | 768 | 781 | 798 | 0 |
| 61 | 629 | 626 | 622 | 618 | 614 |  |  |  |  | 59.59 |  |  |  |  |  |  |  |  |  |  |  |
| 62 |  | 60 |  | 59 |  |  |  |  |  | $60 \cdot 57$ | 13.06 |  |  | 1198 |  | 15 | 172 | 1903 |  | 225 | 62 |
| 63 |  |  | 57 | 57 |  |  |  |  |  | 61.55 | 13.27 |  | 313 | 33 |  | 367 |  |  |  | 438 | 63 |
| 64 | 56 |  | 55 | 5507 | 5467 | 54 |  | 53 | 530 | $62 \cdot 5$ |  | 506 | 52 | 54 | 561 | 579 |  |  |  |  | 64 |
| 65 |  |  |  |  |  |  |  |  |  |  | 13 | 717 |  |  | 7731 | 7916 | 8100 |  |  |  | 65 |
| 66 | 5176 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 495 | 491 | 48 | 4827 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 47 | 46 | 46 | 4601 | 45 | 4517 | 44 | 443 | 439 | 66.43 | 14.33 | 350 | 370 |  | 408 | 428 | 447 | 468 |  |  | 68 |
| 69 |  |  |  |  |  |  |  |  |  |  |  | 561 | 581 |  |  | 640 | 659 | 579 |  |  |  |
| 70 | 4277 | 423 | 419 | 4148 | 4105 | 4062 | 40 | 39 | 393 | 68 | 14. | 772 |  |  | 8325 | 52 | 872 |  |  | 932 | 70 |
| 71 | 405 | 40 | 39 | 3922 | 38 | 383 |  |  |  | 69 |  |  |  |  |  |  | 2073 |  |  |  |  |
| 72 | 382 | 37 | 373 | 3695 | 365 |  | 35 | 35 | 3473 | 70.34 | $15 \cdot 17$ | 194 | 215 |  | 25 |  | 2973 | 317 |  |  | 72 |
|  |  | 35 | 351 | 3469 | 342 |  |  |  | 32 | 71319 | 15.38 | 406 | 426 |  |  | 489 | 509 | 537 |  |  |  |
| 7 | 33 | 33 | 32 | 32 | 31 | 31 | 31 | 30 | 3014 | 72．2968 | 15.596 | 617 | 638 | 659 | 680 | 701 | 722 | 743 | 硡 |  | 74 |
| 75 | 31 |  |  | 3016 | 2970 | 223 |  | 2831 | 278 | 73.2738 | 15.80 | 828 | 8494 |  | 8920 | 913 | 934 | 9560 | 9773 | 99 | 75 |
| 76 | 2929 |  |  |  |  |  |  |  |  |  |  |  | 607 |  |  |  | 147 |  |  |  | 76 |
| 77 | 2705 | 2658 | 2610 | 2563 | 2515 | 2468 | 2420 | 2373 |  |  | 162 | 2s | 2720 |  | 518 |  | 359 |  |  |  | 77 |
| 78 | 24 | 24 | 23 | 36 | 2288 | 2240 | 2192 | 21 | 2096 | $76 \cdot 2047$ | 16.439 | 4612 | 4833 | 505 | 5277 | 549 | 572 | 594 | 616 | 638 | 78 |
| 79 | 2256 | 22032 |  | ， |  | 研 | 1735 |  | 1 | $77 \cdot 1817$ |  | 672 | 6947 | 717 | 739 | 762 | 784 | 806 | 829 | 6519 | 79 |
| 80 | 203 | 1982 | 193 | 1884 | 1834 | 1785 | 1735 | 1686 | 163 | 78．1587 | $16 \cdot 860$ | 883 | 9060 |  | 95 | 974 | 997 | ＋19 |  |  | 80 |
| 81 | 1806 | 175 | 17 | 1657 | 1607 | 1557 | 1507 | 1457 | 140 | 79：1357 |  | 094 | 117 |  | 1634 | 186 | 209 | 232 |  |  | 81 |
| 8 | 1582 | 1531 | 1481 | 1431 |  | 1330 | 1279 | 228 | 117 | 80．1127 | 17－282 | 305 | 328 | 35 | 375 | 398 | 421 | 445 |  | 491 | 82 |
| 83 | 1357 | 1306 | 1255 | 1204 | 1153 | 1102 | 1051 | 099 | dit | d |  | 516 | 520 | 5 | 5872 | \％ | 634 | 657 |  |  | 83 |
| 84 | 1733 | 13081 | 10 | 0978 | 0926 | 0874 | 0822 | 0770 | 071 | 82.066 | $17 \cdot 703$ | 727 | 751 | 775 | 799 | 822 | 846 | 870 | 894 | 918 | 84 |
| 85 |  | 0856 |  |  |  |  |  |  | 0489 | 43 | 17.9 | 9384 | 9626 | 9868 | －109 | 03 | 059 | 083 | 1076 | 13 | 85 |
| 86 | 0683 | 0630 | 057 | 0525 |  |  |  |  |  |  |  | 1495 | （739 |  |  |  | 27 |  |  |  |  |
| 87 | 045 | 040 | 035 | 029 | 0245 | 0191 | 013 | 0084 | 103 | 84．997 | 18：335 | 360 |  | 4100 | 43 | 459 | 484 | 508 |  |  | 87 |
| 88 | 023 | － |  | 㖪 | 18 | 9963 |  | 9855 | 9800 | 85.9746 | 18.546 | 571 | 59 | 62 | 646 | 671 | 696 | 721 |  |  | 88 |
| 89 | －009 | 995 | 990 | 9845 | 9791 | 9736 | 968 | 9626 | 957 | 86.9515 | 18.7573 | 7826 | 8079 | 833 | 858 | 8838 | 909 | 934 | 959 |  | 89 |
| 90 | 9785 | 30 | 96 | 9619 | 9564 | 9508 | 945 | 9397 | 9341 | 87．9285 | 18.9680 | 9936 | －192 | 044 | 070 | 096 | 1216 | 1472 | 172 | 硅 | 90 |
| 9. | 956 |  |  | 9393 | 9336 | 9280 | 922 | 68 | 911 | 9055 | $19 \cdot 178$ | 204 | 230 | 256 | 282 | 308 | 334 | 359 | 38. |  | 91 |
| 92 | 933 | 927 | 920 | 9166 |  | 9053 | 8996 | 8939 | 8882 | 8825 | 19.389 | 415 | 4419 | 468 | 494 | 52 | 546 | 572 |  |  | 92 |
| 93 | 911 | 9054 | 8997 | 8940 | 88 | 8825 | 876 | 8710 | 8652 | $90 \cdot 8595$ | 19.600 | 626 | 653 | 679 | 706 | 73 | 759 | 785 | 81 |  | 93 |
| 94 | 88a | 882 | 8771 | 8713 | 8655 | 8597 | 8539 | 8481 | 8423 | 91．8365 | $19 \cdot 811$ | 837 | 864 | 89 | 918 | 94 | 97 | 998 | －24 | 0516 | 94 |
| 95 | 866 | 860 | 8545 | 8487 | 8428 | 8370 |  | 8252 | 8193 |  | 20.021 | 0488 | 0759 | 1029 | 1299 | 156 | 1839 | 2109 |  |  | 95 |
|  | 843 | 8378 | 8319 | 8260 | 201 | 142 | 08 | 8023 | 7964 |  | 232 | 259 | 8 |  |  | 析 |  |  |  |  | 96 |
|  | 8213 | 815 |  | 803 | 7974 | 7914 | 7854 | 7794 | 7734 | 94.767 | 20.443 | 47 | 4985 |  | 55 | 58 | 6088 | 6364 |  | 6915 | 97 |
| 98 | 798 | 79 |  | 7807 | 75 | 7 | 7626 | 7565 | 7505 | 95．7444 | 20.654 | 6820 |  |  | 7656 | 7934 | 821 | 849 | 8770 | 6， | 98 |
|  | 7763 | 7703 | 7642 | 7581 | 7520 | 7459 | 7398 | 7336 | 7275 | 96.7214 | $20 \cdot 864$ | 893 | 921 | 949 | 9774 | 105 | 033 | 0619 | 9900 |  | 99 |
| 100 | 7539 | 7477 | 7416 | 7354 | 7293 | 7231 | 7169 | 7108 | 7046 | 97．6984 | 21.0756 | 1041 | 1325 | 1609 | 1893 | 2178 | 2462 | 2746 | 3030 | 3315 | 100 |
|  | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | 47 | 46 | 45 | $44^{\prime}$ | ， | 仡 | $41^{\prime}$ | 50＇ | $49^{\prime}$ | $48^{\prime}$ | $147^{\prime}$ | 46 | $45^{\prime}$ | $44^{\prime}$ | $43^{\prime}$ | 研 | $1^{\prime}$ |  |
| 77 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.

| $12^{\circ}$ |  |  |  |  | Cosine. |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $12^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | $21^{\prime}$ | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | 2 |  |  |  |  |  |  |  | 23 | $24^{\prime}$ | $25^{\prime}$ |  |  |  |  |  |
|  | 9769 | 9769 | 9768 | 9767 | 767 | 9766 | 9765 | 9765 | 9764 | 976 | 2136 | 12139 | 2142 | 45 | 147 | 2150 | 3 | 2156 | 2159 | 2162 |  |
|  | 9538 | 9537 | 95 | 95 | 953 | 9532 | 9531 | 9530 | 9528 | 1.952 | 4272 | 4278 | 4283 | 89 | 5 | 4300 | 4306 | 4312 | 4317 |  |  |
|  | 39308 | 930 | 93 |  | 93 |  | 9296 | 9295 | 92 | 2.929 | 6408 | 64 | 6425 | 34 | 2 | 6451 | 6459 |  |  |  |  |
|  | 49077 | 9074 | 907 |  |  |  |  |  |  |  |  | 85 |  |  |  |  |  |  |  |  |  |
| 5 | 58846 | 8843 | 88 | 8837 | 883 | 8830 | 8827 | 8824 | 88 | $4 \cdot 88$ | . 0680 | 06 | 07 | 07 | 0737 | 075 | 07 | 077 | 0794 | 808 |  |
| 6 | 68815 | 86 | 86 | 86 | 86 | 8597 | 8593 | 8589 | 85 | 5.85 | 12816 | 2833 | 2850 | 28 | 2884 | 2901 | 2918 |  |  |  |  |
|  |  | 838 | 83 | 83 |  |  |  |  |  | 6.8 | 1.49 |  |  |  |  |  |  |  |  | 5131 |  |
|  |  | 8149 | 8144 | 81 | 81 | 8129 |  | 8119 | 81 |  |  | 7111 | 7133 | 7156 | 7179 | 7202 | 7224 | 7247 | 7270 | 729 |  |
|  | 9 7923 |  | 7912 |  |  |  |  |  |  |  | 1.9224 | 9249 | 9275 | 9301 | 9326 | 9352 | 9377 | 9403 | 9428 | 9454 |  |
| 10 | 7692 |  |  |  |  |  |  |  | 7642 |  | $2 \cdot 1360$ | 1388 | 1417 | 1445 |  | 1502 | 1530 |  |  |  |  |
| 11 | 1746 | 7455 | 7448 | 7441 | 743 | 7427 | ${ }^{742}$ | 7413 | 7406 | 10.739 | 2.349 | ${ }^{352}$ | 355 | 359 | 3621 |  |  | 3715 |  |  | I |
| 12 | 23 | 722 | 72 | 7208 |  | 7193 | 7186 |  | 71 | 11716 | $2 \cdot 563$ | 5666 | 5700 | 5734 |  | 5802 |  |  |  |  | 12 |
| 13 | 700 | 699 | 6984 | 69 | 6967 | 6959 | 6951 | 6943 | 6935 | 12.6927 | $2 \cdot 7768$ | 7805 | 7842 | 7879 | 7916 | 7953 | 798 | 8026 | 8063 | 81 |  |
| 14 | 6769 | 676 | 675 | 67 | 6734 | 6725 | 6717 | 6708 | 6699 | 13.6690 | 2.9904 | 9944 | 9983 | -023 | 0063 | 01 | 014 | 01 | 022 |  | 4 |
| 15 | 653 | 652 | 65 | 6510 | 65 | 6491 | 6482 | 6473 | 6463 | 14.6454 | 3.2040 | 208 | 21 | 2168 | 2210 | 2253 | 229 | 2338 | 238 | 2423 | 15 |
| 16 | 6307 | 629 | 628 | 62 | 62 | 62 | 62 | 6238 | 622 | 15.621 | 3.4176 | 4221 | 42 | 2 | 58 | 03 | 989 | 4494 |  | 4585 | 16 |
| 17 |  | 606 | 605 | 60 | 603 | 6024 | 6013 | 6002 |  | 16.59 | 3.6312 |  |  | 6457 |  | 6553 |  |  |  |  | 析 |
| 18 | 5846 | 58 | 58 |  |  |  |  |  | 5756 | $17 \cdot 57$ | $3 \cdot 8448$ | 84 |  |  | 8652 | 8703 | 87 | 880 |  |  | 8 |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9 |
| 20 | 5384 | 537 | 5359 | 5347 | 5334 |  |  | 5297 | 5284 | 19 |  |  |  | 2890 | 2947 |  |  |  |  |  | 20 |
| 21 | 5154 |  |  |  |  |  |  |  |  | 20.50 | 4.48 |  |  |  |  |  |  |  |  |  | 21 |
| 22 | 492 | 49 |  |  |  | 48 | 4840 | 48 |  |  |  |  |  |  |  |  | 736 |  |  |  | 22 |
| 23 | 4692 | 4678 | 4663 | 4649 | 4635 | 4620 | 4606 | 45 | 4577 | 22.45 | .9128 | 91 | 9258 | 9324 | 89 | 9454 |  | 958 |  |  | 23 |
| 2 | 4461 | 4446 | 4431 | 4416 | 44 | 4386 | 4371 | 4356 | 4341 | 23 | $5 \cdot 1$ | 13 | 14 | 1468 | 153 | 160 |  |  |  |  |  |
| 25 | 4230 | 42 | 4199 | 4184 | 41 | 4152 | 4137 | 4121 | 4105 | 24 | $5 \cdot 3$ | 347 | 35 | 361 | 36 | 375 | 3826 | 389 | 3968 | 4039 | 25 |
| 26 | 40 | 39 | 3967 | 395 | 3935 | 3919 | ${ }^{3902}$ | 3886 | 3870 | ${ }^{25 \cdot 3}$ | $5 \cdot 553$ | 561 | 568 | 575 | 5831 | 5905 |  | 60 |  |  | 26 |
| $27$ |  | 375 | 373 | 3718 | 37 | 36 | 3668 | 51 | 36 | $26^{\circ}$ | 5.767 | 77 |  |  |  | 805 | 8132 |  |  |  | 27 |
| 28 | 35 | 35 | 350 | 34 | 34 |  | 3433 | 3416 | 3398 | 27 | . 98 | 98 | 9967 | . 046 | 26 |  |  | 03 |  |  | 28 |
| 29 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 29 |
| 30 | 307 | 3058 | 3039 | 3020 |  | 2983 |  |  | 292 | $29 \cdot 290$ |  |  | 4250 | 4335 | 4421 | 4506 |  |  |  |  | 0 |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 32 |
| 33 |  | 23 | 23. |  | 23 | 2281 | 226 |  |  |  |  |  |  |  | 0863 | 0956 | 105 |  |  |  | 33 |
| 34 | 215 | 21 |  |  | 2069 |  |  |  | 19 |  |  |  | 28 | 2913 | 10 | 310 |  |  |  |  | 34 |
| 35 | 1923 | 1901 | 187 | 185 | 1835 | 13 | 1792 | 1770 | 1748 | 34.172 | 7.4760 | 485 | 4958 | 5058 | 57 | 525 | 53. | 5456 | 5555 | 5654 | 35 |
| 36 | 1692 | 1669 | 1647 | 1624 | 1602 | 1580 | 1557 | 1534 | 15 | 35.148 | 7.689 | 69 | 71 | 720 |  | 740 |  | 7612 |  |  | 36 |
| 37 | 1461 | 1438 | 1415 | 1392 | 136 | 13 | 1322 |  | 1276 | $36^{1} 12$ | $7 \cdot 9032$ | 913 | 92 | 934 | 52 | 955 |  |  |  |  | 37 |
| 38 | 1230 | 120 | 1183 | 1159 | 1135 | 11 | 1088 | 1064 |  | 37.10 | 8.116 | 127 | 13 | 149 |  | 170 | 18 | 192 |  | 213 | 8 |
|  |  |  |  |  |  | 0878 | 0853 |  |  |  |  | 34 |  | 36 |  | 3058 |  |  |  |  |  |
| 40 | 076 | 074 | 0719 | 062 | 0669 | 0644 | 0619 |  | 0569 |  |  | 555 |  | 578 | 5894 |  | 612 | 623 |  |  | 40 |
| 41 | 0538 | 0512 | 0487 | 0461 | 04 | 0410 | 0384 |  | 0333 |  | 8.7576 |  |  |  |  |  |  |  |  |  |  |
| $42$ |  |  |  | 022 | 02 | 0176 | 0150 | 01 | 009 | 41 | 8.97 | 983 | 99 | -020 | 018 | 030 | 042 | 05 |  |  | 2 |
| 43 | 007 | 00 | 10 | 997 | 99 | 9942 | 9915 |  | 9861 |  |  | 19 | 20 |  | 2336 | 245 |  |  |  |  | 43 |
| 44 | 98 |  |  |  |  |  |  |  |  |  |  | 4108 | 423 | 4359 | 84 |  | 473 |  |  |  |  |
| 45 |  |  | 9559 | 9531 | 9503 | 4 | 9446 | 9418 |  | 43.9362 | 9.6119 | 62 | 637 | 650 | 6631 | 67 | 68 | 70 | 7142 | 7270 | 5 |
| 46 | 938 | 93 | 9327 | 98 | 9269 | 9241 | 9212 | 9183 | 9154 | 44 | 9.8 | 8386 | 85 | 8648 | 78 | 09 | 904 | 917 | 93 |  | 46 |
| 47 | 915 |  |  |  |  | 9007 |  |  | 8918 |  | 10.03 |  |  |  | 26 | 105 | 1193 | 13 |  |  |  |
| 48 | 89 | 88 | 88 | 8833 | 88 | 8773 | 8743 | 8713 | 8682 |  | $10^{12527}$ | 266 | 28 | 293 |  | 539 | 3346 |  |  |  | 48 |
| 49 |  |  |  |  | 85 | 85 | 8508 | 8477 | 844 |  | 1-363 | 480 | 494 | 50 | 5220 | 536 |  | 56 |  |  | 49 |
| 50 | 846 | 843 | 83 | 8367 | 8336 | 8305 | 8274 | 8242 | 8211 | $48 \cdot 8179$ | 10.6799 | 694 | 708 | 722 | 736 | 751 | 765 | 779 | 793 |  | 50 |
| 51 | 823 | 819 | 81 | 813 | 8103 | 8071 | ${ }^{8039}$ | 800 | 7975 | 49.794 | $\frac{10.893}{}$ |  |  |  |  |  | 98 |  |  |  |  |
| 52 |  | 7967 |  |  | 78 | 7837 | 78 | 7772 | 7739 | 50.77 | $11 \cdot 107$ | 121 | 13 |  |  | 181 |  |  |  |  | 2 |
| 53 | 776 |  |  | 76 | 7636 | 76 | 75 | 7537 | 7504 | 51.7 | 11 | 335 | 135 |  | 10 | 3960 | 411 | 42 |  |  | 3 |
| 54 |  |  |  |  |  |  |  | 7302 |  |  | 11.5 |  |  |  | 57 |  |  |  |  |  |  |
| 55 | 7307 | 727 | 7238 |  |  | 7135 |  |  |  |  |  |  | 7792 | 7948 | 8104 | 8261 | 8417 | 8573 | 8729 |  | 55 |
| 56 | 707 |  |  | 6971 | 6936 | 690 |  |  |  |  |  |  | 99 | 10 | 0252 | 04 | 057 | 072 | 088 |  | 56 |
| 57 | 686 | ${ }^{681}$ | 675 | 65 | 670 | 6668 | 66 | 659 | 6560 | 55.6 | 12.17 | 19 |  |  |  |  |  | 288 | 3047 |  |  |
| 58 | 661 | 657 | 654 | 6506 | 6470 | 6434 | 63 | 636 | 6325 | 56.62 | 12.38 | 40 | 4217 | 4382 | 46 | 471 | 487 | 50 |  |  | 58 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 59 |
| 60 |  |  |  |  |  |  |  |  | 5853 | 58.5815 |  | 8330 | 8500 |  |  | 9012 |  |  |  |  |  |
| 61 | 5922 | 588 | 58 | 5808 | 5770 | 5732 | 5694 | 5656 | 5617 |  |  | 24, |  |  |  |  |  | 1508 |  |  |  |
|  |  | 56 | 5614 | 55 | 5537 | 5498 | 5459 | 5420 | 5382 | 60.534 | 13.2431 | 2607 | 27 | 2, | 3136 |  | 5483 | 568 |  |  |  |
| 6 | 54 |  |  | 53 | 5304 | 5264 | 52 | 5185 | 5146 | 61.510 | 13.456 | 4746 | 49 | 5104 |  | 5462 | 564 | 582 |  | 617 | 63 |
| 64 |  |  |  |  |  |  |  | 4 | 491 |  |  | 68 |  |  |  |  | 779 | 797 | 815 |  | 64 |
| 65 | 49 | 4959 | 4918 | 4878 | 48 | 47 | 4756 | 471 | 4674 | 63. | 13.8839 |  | 9209 | 9393 | 9578 | 9763 | 9947 | 132 | 03 |  | 55 |
| 66 |  |  |  | 46 | 4604 |  |  | 4480 | 4438 | 64*43 |  |  |  |  |  |  |  |  |  |  |  |
|  | 453 |  | 4454 | 44 | 4370 | 4329 | 4287 | 4245 | 4203 | 65 | $14 \cdot 3$ | 330 | 349 | 36 | 3873 | 4063 | 4253 | 444 | 4634 |  | 67 |
| ${ }^{68}$ | 4307 | 42 |  |  | 413 | 4095 | 4052 | 4009 | 3967 |  | 14.5 | 5440 |  |  |  | 13 |  |  |  |  | ${ }_{6}^{68}$ |
| ${ }_{70} 6$ |  |  |  |  |  |  |  |  |  |  | (14.7383 14.9519 |  |  |  |  |  |  |  | 11 |  | 69 |
| 71 | 36 | 3570 | 3526 | 3482 | 3437 | 3393 | 3349 | 3304 | 3259 | $69 \cdot 32$ | $\frac{15165}{}$ | 1857 |  |  |  | 2664 | 2865 | 3067 | 326 |  |  |
| 72 | 33 | 33 | 329 | 220 | 32 | 315 | , | 206 | 3024 | 72978 | 15.3791 | 3996 | 420 | 4405 | 46 | 4814 | S | 5223 | 542 | 5 | 2 |
| 73 | 3153 | 31 | 30 | 3016 | 297 | 2925 | 28 | 2834 | 2788 | 71.274 | 15.5927 | 6135 | 634 | 65 | 6757 | 6964 | 7172 | 7379 | 758 | 77 | 73 |
| 74 |  | 28 | 28 |  | 2738 | 26 | 2645 | 259 | 255 | 72.250 | $15 \cdot 8$ | 8273 | 84 | 86 | 890 | 91 | 93 | 953 |  |  | 74 |
| 75 | 269 | 264 | 259 | 2551 | 2504 | 2457 | 2410 | 236 | 2316 |  |  | 0412 |  | 08 | 1051 | 1265 | 1478 | 1691 | 19 |  | 75 |
| 76 | 24 | 24 | 236 | 23 | 2271 | 22 | 21 | 2128 | 2081 | 74:20 | 16.43 | 255 | 27 | 2127 | 3198 | 345 | ${ }^{363}$ | 3847 | 4062 |  |  |
|  |  | 2182 | 213 | 208 | 2038 |  | 19 | 1893 | 1845 | $75 \cdot 17$ | 16.447 | 469 | 49 | 51 | 5346 | 55 | 578 | 60 | 622 | 64 |  |
| 78 | 1 | 1950 | 1902 | 1853 | 15 | 1756 | 1 | 1658 | 1609 |  |  | 682 |  |  |  |  |  |  |  |  | 78 |
| 79 80 |  |  | 1670 |  |  | 1522 |  |  |  | 78 | 16.877 |  |  |  |  |  |  |  |  |  | 90 |
| $\frac{80}{81}$ | 153 | ${ }_{148}^{125}$ | 1238 | 13 |  |  |  |  | 09 |  |  |  |  |  |  |  |  |  |  |  | $\frac{80}{81}$ |
| 8181 82 | 107 | 12 | 12 | 09 | 087 | 082 | 07 | 07 | ${ }_{06}^{09}$ |  | 17 | 53 | ${ }^{346}$ | 585 |  |  | 6549 |  | 70 |  | 81 82 |
| 83 | 0845 | O7 | 07 |  | -638 | 0586 | 0534 | 4482 | 243 | 81.0378 | $17 \cdot 7287$ | 752 | 7 | 793 | 8230 | 846 |  | 89 | 917 | 94 | 83 |
| 84 | 06 | - | 0509 | 045 | 0405 | 0352 | 0300 | 通 | 019 | 82.0141 | 17.9423 | 966 | 99 | -13 | 257 | 0616 | 0855 | 1094 | 133 | 157 | 84 |
| 85 | 03 | 03 | 0277 | 02 | 0171 | 0118 | 0065 | -012 | 995 | 82.9905 | 18.1559 | 1800 | 2042 | 228 | 2525 | 2766 | 3008 | 3249 | 349 | 373 | 85 |
| 86 | 015 | 009 | +045 | 9992 | 9938 | 9884 | 9831 | 977 | 9723 | 83.9669 | 18.36 | 393 | 4184 | 4428 | 4672 | 4917 | 5161 | 5405 | 5650 |  |  |
| 8 | 992 | 98 | 98 | 975 | 9705 | 9651 | 9596 | 9542 | 9487 | 84:9432 | 18.58 | 607 | 63 | 65 | 6820 | 706 | 7314 | 7561 |  | 805 |  |
| 88 |  | 9636 | 9581 | 952 | 9472 | 9417 | 9362 | 930 | 925 | $85 \cdot 9$ | 18.79 | 821 | 846 | 871 | 896 | 921 | 946 | 9717 | 99 | 12 |  |
| 89 90 | 946 |  | 917 | 9294 | 9238 | 9183 | 8892 |  | 9015 | ${ }_{87}^{86}$ | 19.0103 19.2239 | ${ }_{24} 03$ | 27 | 300 | 326 | 3517 | 3773 | 402 | 42 |  |  |
| 91 | 899 |  | 8885 | 8829 | 8772 | 8715 | 86 | 8601 | 854 | 88.848 | 19.4375 | 4633 | 489 | 515 | 540 | 56 | 5926 |  |  |  |  |
| 9 | 8768 | 871 | 86 | 85 | 8539 | 8481 | 84 | 8366 | S30 | 89 •82 | 19.651 | 677 | 703 | 729 | 75 | 78 | 80 | 83 | 86 | 88 | 92 |
| 93 | 8537 | 8478 | 8421 | 8363 | 8305 | 8247 | 8189 | 8131 |  |  |  |  |  | 944 | 97 |  | 12 | 0496 |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |  | 20 | 1050 |  |  |  |  |  |  |  |  |  |
| 95 | 807 | 801 | 7957 | 789 | 7839 | 7779 | 720 | 766 | 7601 | 92.754 | 20.291 | 318 | 3459 | 372 | 3999 | 4268 | 4538 | 480 | 507 | 53 | 95 |
| 96 | 785 | 7785 | 72 | 76 | 7605 | 7545 | 7485 | 7425 | 7365 | 93.73 | 20.50 | 5328 | 5600 | 5873 | 6146 |  | 6691 | 6964 | 723 |  |  |
| 97 | 7614 | 7554 | 7493 | 7433 | 7372 | 7312 | 7251 | 6955 | 293 | 94.70 9568 | $20 \cdot 71$ | 7466 | ${ }_{9884}^{774}$ |  |  | 8569 | 8844 |  |  |  |  |
| 98 |  |  |  |  |  |  |  | 6955 | 6895 |  | 20.9327 21.1463 | 196 |  |  | 0441 2588 |  | 3150 | 3632 |  |  |  |
|  | 6922 | 6859 | 6797 | 6735 | 6672 | 6610 | 6547 | 6485 | 6422 | 97.6359 | 21.3599 | 3883 | 4167 | 4451 | 4735 | 5019 | 5304 | 5588 | 5872 | 6156 | 100 |
|  | $40^{\circ}$ | 39' | $38^{\prime}$ | 37 | $36^{\prime}$ | $35^{\prime}$ | $3{ }^{1}$ | 33 | $32^{\prime}$ | $31^{\prime}$ | $40^{\prime}$ | 39 | 38 | 37 | 36 | 35' | 34 | 33 |  | 1 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $12^{\circ}$ |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $12^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | 33＇ | $34^{\prime}$ | $35^{\prime}$ | $36^{\prime}$ | ｜ $37{ }^{\prime}$ | $38^{\prime}$ | $39^{\prime}$ | $30^{\prime}$ | $31^{\prime}$ | 32＇ | $33^{\prime}$ | $34^{\prime}$ | 35＇ | $36^{\prime}$ |  | $38^{\prime}$ | ［39 |  |
|  | 9763 | 9762 | 9762 | 9761 | 9760 | 9760 | 9759 | 9759 | 97 | 9757 | 21 | 2167 | 2170 | 2173 | 2176 | 2179 | 2181 | 37 |  | 2190 |  |
| 2 | 9526 | 9525 | 9523 | 9522 | 9521 | 9520 | 9518 | 95 | 9516 | 1.9515 | 4329 | 4334 | 4340 | 4346 | 4352 | 4357 | 436 | 4369 | 4374 | 43 | 1 <br> 2 <br> 3 <br> 4 <br> 5 |
| 3 | 928 | 9287 | 9285 | 9283 | 9281 | 9279 | 9278 | 9276 | 9274 | 2.9272 | 6493 | 6502 | 6510 | 6519 | 6527 | 6536 | 6544 | 6553 | 6561 | 6570 |  |
|  | 9052 | 9049 | 9047 | 9044 | 9042 | 9039 | 9037 | 903 | 9032 | 3.9029 | 865 | 8669 | 8680 | 8692 | 870 | 871 | 872 | 8737 | 8748 | 87 |  |
| 5 | 8815 | 8812 | 8808 | 8805 | 8802 | 8799 | 8796 | 8793 | 8789 | 4.8786 | $1 \cdot 0822$ | 0836 | 0850 | 0865 | 0879 | 0893 | 0907 | 0921 | 0936 | 095 |  |
| 6 | 8578 | 8574 | 8570 | 8566 | 8563 | 8559 | 8555 | 8551 | 8547 | 5.8544 | $1 \cdot 2986$ | 3003 | 3020 | 3037 | 3055 | 3072 | 3089 | 3106 | 3123 | 3140 | 6 |
|  | 8341 | 8336 | 8332 | 8327 | 8323 | 8319 | 8314 | 8310 | 8305 | 6.8301 | 1.5151 | 5171 | 5191 | 5210 | 5230 | 5250 | 5270 | 5290 | 5310 | 5330 |  |
|  | 8104 | 8099 | 8094 | 8089 | 8083 | 8078 | 8073 | 8068 | 8063 | $7 \cdot 8058$ | $1 \cdot 7315$ | 7338 | 7361 | 738 | 740 | 742 | 745 | 7474 | 749 | 75 |  |
| 9 | 7867 | 7861 | 7855 | 7850 | 7844 | 7838 | 7833 | 7827 | 7821 | 8.7815 | 1.9480 | 9505 | 9531 | 9556 | 9582 | 9607 | 9633 | 9658 | 9684 | 9710 |  |
| 10 | 7630 | 7623 | 7617 | 7611 | 7604 | 7598 | 7592 | 7585 | 7579 | $9 \cdot 7573$ | 2.164 | 1672 | 1701 | 1729 | 175 | 178 | 1814 | 1843 | 187 | 1899 | 0 |
| 11 | 7393 | 7386 | 7379 | 737 | 7365 | 7358 | 7351 | 73 | 7337 | 10.7330 | ． 38 | 40 | 3871 | 3902 | 3933 | 39 | 3996 | 4027 | 4058 | 4089 | 11 |
| 12 | 7156 | 7148 | 7140 | 7133 | 7125 | 7118 | 7110 | 7102 | 7095 | 11.7087 | 2.5973 | 6007 | 6041 | 6075 | 6109 | 614 | 617 | 6211 | 6245 | 627 | 12 |
| 13 | 6918 | 6910 | 6902 | 6894 | 6886 | 6877 | 6869 | 6861 | 6853 | 12.6844 | 2.8137 | 8174 | 8211 | 8248 | 8285 | 8322 | 8359 | 8396 | 8432 | 8469 | 13 |
| 14 | 6681 | 6673 | 6664 | 6655 | 6646 | 6637 | 6628 | 6619 | 6611 | 13.6602 | 3.0302 | 0341 | 0381 | 042 | 046 | 050 | 05 | 0580 | 062 | 065 | 14 |
| 5 | 6444 | 6435 | 6425 | 6416 | 6407 | 6397 | 6388 | 6378 | 6368 | 14.6359 | 3.2466 | 2509 | 2551 | 2594 | 2636 | 267 | 2721 | 2764 | 280 | 28 | 15 |
| 16 | 620 | 6197 | 6187 | 6177 | 6167 | 6157 | 6147 | 6137 | 6126 | 15.6116 | 3.4630 | 4676 | 4721 | 4767 | 4812 | 4857 | 490 | 4948 | 499 | 503 | 16 |
| 17 | 5970 | 5960 | 5949 | 5938 | 5927 | 5917 | 5906 | 5895 | 5884 | 16.5873 | 3.6795 | 6843 | 6891 | 6940 | 6988 | 7036 | 7084 | 7133 | 7181 | 7229 | 17 |
| 8 | 5733 | 5722 | 5711 | 5699 | 5688 | 5676 | 5665 | 5654 | 5642 | 17.5631 | 3.8959 | 9010 | 9061 | 9112 | 9164 | 92 | 92 | 9317 | 9368 | 941 | 18 |
| 19 | 5496 | 5484 | 5472 | 5460 | 5448 | 5436 | 5424 | 5412 | 5400 | 18.5388 | $4 \cdot 1124$ | 1177 | 1231 | 1285 | 1339 | 139 | 144 | 1501 | 1555 | 160 | 19 |
| 0 | 5259 | 5247 | 5234 | 5221 | 5209 | 5196 | 183 | 5171 | 5158 | 19.5145 | 4.32 | 3345 | 3402 | 345 | 3515 | 357 | 3629 | 3685 | 374 | 379 | 20 |
| 21 | 5022 | 5009 | 499 | 149 | 496 | 495 | 4943 | 49 | 49 | $20 \cdot 4902$ | $4 \cdot 54$ | 5512 | 55 | 56 | 56 | 57 | 5810 | 5870 | 5929 |  | 21 |
| 22 | 4785 | 4771 | 4757 | 4743 | 4730 | 4716 | 4702 | 4688 | 4674 | $21 \cdot 4660$ | $4 \cdot 76$ | 7679 | 7742 | 7804 | 786 | 7929 | 7992 | 8054 | 811 | 817 | 22 |
| 23 | 4548 | 4534 | 4519 | 4505 | 4490 | 4475 | 4461 | 4446 | 4432 | 22.4417 | 4.9781 | 9846 | 9912 | 9977 | －042 | 0108 | 0173 | 0238 | 0304 | 036 | 23 |
| 24 | 4311 | 4296 | 4281 | 4266 | 4250 | 4235 | 4220 | 4205 | 4190 | 23.4174 | 5.1946 | 2014 | 2082 | 2150 | 2218 | 228 | 2354 | 2423 | 249 | 25 | 24 |
| 25 | 4074 | 4058 | 4042 | 4027 | 4011 | 3995 | 3979 | 3963 | 3947 | 24•3932 | 5.4110 | 4181 | 4252 | 4323 | 4394 | 4465 | 4536 | 4607 | 4678 | 474 | 25 |
| 26 | 3837 | 3821 | 3804 | 378 | 377 | 375 | 3738 | 3722 | 37 | $25 \cdot 3689$ | 5．6274 | 6348 | 6422 | 6496 | 6570 | 664 | 671 | 6791 | 686 | 693 | 26 |
| 27 | 3600 | 3583 | 3566 | 3549 | 3532 | 3515 | 3498 | 3480 | 3463 | 26.3446 | 5.8439 | 8515 | 8592 | 8669 | 8745 | 8822 | 8899 | 8975 | 9052 | 912 | 27 |
| 28 | 3363 | 3345 | 3328 | 3310 | 3292 | 3274 | 3257 | 3239 | 3221 | $27 \cdot 3203$ | 6.0603 | 0683 | 0762 | 0842 | 092 | 100 | 1080 | 1160 | 123 | 131 | 28 |
| 29 | 3126 | 3108 | 3089 | 3071 | 3053 | 3034 | 3016 | 2997 | 2979 | 28.2961 | 6.2767 | 2850 | 2932 | 3015 | 3097 | 3179 | 3262 | 3344 | 342 | 35 | 29 |
| 30 | 2889 | 2870 | 2851 | 2832 | 2813 | 2794 | 2775 | 2756 | 2737 | 29.2718 | 4932 | 5017 | 02 | 5187 | 527 | 535 | 54 | 5528 | 561 | 56 | 30 |
| 31 | 2652 | 2632 | 2613 | 2593 | 2573 | 255 | 2534 | 2515 | 24 | 30．2475 | 67096 | 7184 | 7272 | 7360 | 7448 | 75 | 76 | 77 | 7800 |  | 31 |
| 32 | 2415 | 2395 | 2374 | 2354 | 2334 | 231 | 2293 | 2273 | 225 | $31 \cdot 223$ | 6.92 | 9352 | 9442 | 9533 | 9624 | 971 | 980 | 989 | 998 | ＋078 | 32 |
| 33 | 2178 | 2157 | 2136 | 2115 | 2094 | 2073 | 2053 | 2032 | 2011 | 32．1990 | $7 \cdot 1425$ | 1519 | 1613 | 1706 | 1800 | 189 | 1987 | 2081 | 2175 | 226 | 33 |
| 34 | 1941 | 1919 | 1898 | 1876 | 1855 | 1833 | 1812 | 1790 | 1768 | 33．1747 | 7.3589 | 3686 | 3783 | 3879 | 3976 | 4072 | 416 | 4265 | 436 | 445 | 34 |
| 35 | 1704 | 1682 | 1659 | 1637 | 1615 | 1593 | 1571 | 1549 | 1526 | 34．1504 | 7.5754 | 5853 | 5953 | 6052 | 6151 | 6251 | 635 | 64 | 654 | 66 | 35 |
| 36 | 1467 | 14 | 1421 | 1398 | 137 | 1353 | 1330 | 1307 | 28 | 35 | 77918 | 8020 | 8123 | 8225 | 8327 | 8429 | 8532 | 8634 | 8736 | 8838 | 36 |
| 37 | 1230 | 1206 | 1183 | 1160 | 1136 | 173 | 1089 | 1066 | 1042 | 36．1019 | ．0083 | 0188 | 0293 | 0398 | 0503 | 060 | 071 | 0818 | 0923 | 102 | 37 |
| 38 | 0992 | 0969 | 0945 | 0921 | 0897 | 0872 | 0848 | 0824 | 0800 | 37．0776 | ．2247 | 2355 | 2463 | 2571 | 2679 | 278 | 2894 | 3002 | 3110 | $32 / 8$ | 38 |
| 39 | 0755 | 0731 | 0706 | 82 | 0657 | 0632 | 0608 | 0583 | 0558 | $38^{\circ} 0533$ | 8.4411 | 4522 | 4633 | 4744 | 4854 | 496 | 5076 | 5187 | 5297 | 5408 | 39 |
| 40 | 0518 | 0493 | 0468 | 43 | 0417 | 0392 | 0367 | 0341 | 0316 | 980 | 8.6576 | 6689 | 688 | 6917 | 703 | 714 | 725 | 737 | 748 | 7598 | 40 |
| 41 | 0281 | 0256 | 0230 | 0204 | 0178 | 0152 | 0126 | 0100 | 0074 | 40.004 | 8.8740 | 88 | 8973 | 9090 | 9206 | 932 | 943 | 9555 | 9672 | 9788 | 41 |
| 42 | 0044 | －018 | 9991 | 9965 | 9938 | 99 | 9885 | 9858 | 9832 | 40.980 | 9．090 | 102 | 1143 | 1262 | 1382 | 150 | 162 | 173 | 185 | 1978 | 42 |
| 43 | 9807 | 9780 | 9753 | 9726 | 9699 | 9671 | 9644 | 9617 | 9590 | 41.956 | 9．3069 | 3191 | 3313 | 3435 | 3557 | 367 | 380 | 392 | 4046 | 4168 | 43 |
| 44 | 9570 | 9543 | 9515 | 9487 | 9459 | 9431 | 9403 | 9375 | 9347 | 42.931 | $9 \cdot 5233$ | 5358 | 5483 | 5608 | 5733 | 585 | 5983 | 6108 | 6233 | 635 | 44 |
| 45 | 9333 | 9305 | 9276 | 9248 | 9220 | 9191 | 9163 | 9134 | 9105 | 43.9077 | 9.7398 | 7526 | 7653 | 7781 | 7909 | 803 | 8164 | 829 | 8420 | 8548 | 45 |
| 46 | 9096 | 9067 | 9038 | 9009 | 8980 | 89 | 8922 | 8893 | 8863 | 44 | 9.9562 | 9693 | 98 | 9954 | ＋085 | 02 | 0346 | 0476 | 7 | 38 | 46 |
| 47 | 8859 | 8830 | 8800 | 8770 | 8740 | 8711 | 8681 | 8651 | 8621 | $45 \cdot 8591$ | 10.1727 | 1860 | 1994 | 2127 | 2260 | 2394 | 252 | 266 | 2794 | 2928 | 47 |
| 48 | 8622 | 8592 | 8562 | 8531 | 8501 | 8470 | 8440 | 8410 | 8379 | $46^{\circ} 8348$ | 10.3891 | 4027 | 4164 | 4300 | 4436 | 4572 | 4709 | 484 | 4981 | 5118 | 48 |
| 49 | 8385 | 8354 | 8323 | 8292 | 8261 | 8230 | 8199 | 8168 | 8137 | 47－8106 | $10 \cdot 6055$ | 6195 | 6334 | 6473 | 6612 | 6751 | 6890 | 702 | 7168 | 730 | 49 |
| 50 | 8148 | 8117 | 8085 | 8053 | 8022 | 7990 | 7958 | 7927 | 7895 | $48 \cdot 7863$ | 10 ＇8220 | 836 | 850 | 8646 | 87 | 8930 | 907 | 2 | 935 | 949 | 50 |
| 51 | 7911 | 7879 | 7847 | 7814 | 7782 | 7750 | 7718 | 7685 | 7653 | 497620 | 11.0384 | 0529 | 0674 | 0819 | 0963 | 1108 | 1253 | 139 | 1543 | 1687 | 51 |
| 52 | 7674 | 7641 | 7608 | 7576 | 7543 | 7510 | 7477 | 7444 | 7411 | 50．7378 | 11.2549 | 269 | 2844 | 2992 | 3139 | 328 | 343 | 358 | 3730 | 3877 | 52 |
| 53 | 7437 | 7403 | 7370 | 7337 | 7303 | 7270 | 7236 | 7202 | 7169 | 51.7135 | 11.4713 | 4864 | 5014 | 5164 | 5315 | 5465 | 5616 | 576 | 5917 | 6067 | 53 |
| 54 | 7200 | 7166 | 7132 | 7098 | 7063 | 7029 | 6995 | 6961 | 6926 | 52．6892 | 11.6877 | 703 | 7184 | 7337 | 7491 | 7644 | 7797 | 7951 | 8104 | 8257 | 54 |
| 55 | 6963 | 6928 | 6893 | 6859 | 6824 | 6789 | 6754 | 6719 | 6684 | 53.6649 | 11.9042 | 9198 | 9354 | 9510 | 9666 | 9823 | 9979 | 1135 | 0291 | 0447 | 55 |
| 56 | 67 | 66 | 66 | 6620 | 65 | 65 | 6513 | 6478 | 64 | 54．6407 | $12 \cdot 1206$ | 1365 | 152 | 16 | 184 | 2001 | 2160 | 23 | 2478 | 37 | 56 |
| 57 | 6489 | 6453 | 6417 | 6381 | 6345 | 6309 | 6273 | 6236 | 6200 | 55.6164 | 12.337 | 3532 | 3694 | 3856 | 4018 | 4180 | 4342 | 4503 | 4665 | 4827 | 57 |
| 58 | 6252 | 6215 | 6179 | 61 | 6105 | 6069 | 603 | 5995 | 5958 | 56.5921 | 12.5535 | 570 | 586 | 6029 | 6194 | 6358 | 6523 | 668 | 6852 | 7017 | 58 |
| 59 | 6015 | 5977 | 5940 | 5903 | 5866 | 5828 | 5791 | 5753 | 5716 | 57.5678 | 12.7699 | 786 | 8034 | 8202 | 8369 | 8537 | 8704 | 887 | 9039 | 9207 | 59 |
| 60 | 5778 | 5740 | 5702 | 5664 | 5626 | 588 | 5550 | 5512 | 5474 | 58．5436 | 12.9864 | －03 | 0205 | 037 | 05 | 071 | 088 | 1056 | 122 | 397 | 60 |
| 61 | 5541 | 5502 | 5464 | 5425 | 5387 | 5348 | 530 | 5271 | 5232 | 59.5193 | 13.2028 | 2201 | 2375 | 2548 | 2721 | 2894 | 3067 | 324 | 14 | 3587 | 61 |
| 62 | 5304 | 5264 | 5225 | 5186 | 5147 | 5108 | 5068 | 5029 | 4990 | $60 \cdot 4950$ | 13.4193 | 436 | 4545 | 472 | 4897 | 5073 | 524 | 5425 | 5601 | 5777 | 62 |
| 63 | 5066 | 5027 | 4987 | 4947 | 4907 | 4868 | 4828 | 4788 | 4748 | 61.4707 | 13.6357 | 6536 | 6715 | 6894 | 7073 | 7251 | 7430 | 位 | 7788 | 7967 | 63 |
| 64 | 4829 | 4789 | 4749 | 4708 | 4668 | 4627 | 458 | 4546 | 4505 | 62.4465 | 13.8521 | 8703 | 8885 | 9067 | 9248 | 9430 | 9612 | 9793 | 9975 | ＋157 | 64 |
| 65 | 4592 | 4551 | 4510 | 4469 | 4428 | 4387 | 4346 | 4305 | 4263 | 63.4222 | 14.0686 | 0870 | 1055 | 1239 | 1424 | 1609 | 179 | 1978 | 2162 | 234 | 65 |
| 66 | 4355 | 4314 | 4272 | 4230 | 4189 | 4147 | 4105 | 4063 | 4021 | 64＊3979 | 14.2850 | 3038 | 3225 | 3412 | 360 | 3787 | 397 | 416 | 434 | 453 | 66 |
| 67 | 4118 | 4076 | 4034 | 3992 | 3949 | 3907 | 3864 | 3822 | 3779 | $65 \cdot 3736$ | 14.5015 | 5205 | 5395 | 5585 | 5776 | 5966 | 6156 | 634 | 6536 | 672 | 67 |
| 68 | 388 | 38 | 37 | 375 | 3710 | 3667 | 3623 | 3580 | 3537 | 66.3494 | 14.7179 | 7372 | 75 | 7758 | 795 | 8144 | 8337 | 8530 | 8723 | 8916 | 68 |
| 69 | 3644 |  |  | 3514 | 3470 | 3426 | 3383 | 3339 | 3295 | $67 \cdot 3251$ | 14.9343 | 9539 | 左 | 9931 | －127 | 0323 | 0519 | 071 | 921 | 116 | 69 |
| 70 | 3407 | 3363 | 3319 | 3275 | 3230 | 3186 | 142 | 3097 | 3053 | $68 \cdot 3008$ | 15＊1508 | 1707 | 190 | 210 | 230 | 2502 | 2700 | 289 | 309 | 329 | 70 |
| 71 | 3170 | 3125 | 3081 | 3036 | 2991 | 2946 | 2901 | 2856 | 2811 | 69＇2765 | $15 \cdot 3672$ | 3874 | 4075 | 4277 | 4479 | 4680 | 4882 | 5083 | 5285 | 5486 | 71 |
| 72 | 2933 | 2888 | 2842 | 2797 | 2751 | 2706 | 2660 | 2614 | 2569 | 70．2523 | 15.5837 | 6041 | 6245 | 6450 | 6654 | 6859 | 7063 | 726 | 74 | 767 | 72 |
| 73 | 2696 | 2650 | 2604 | 2558 | 2512 | 2466 | 2419 | 2373 | 2326 | 71.2280 | $15 \cdot 8001$ | 8208 | 8416 | 8623 | 8830 | 903 | 9245 | 945 | 965 | 986 | 73 |
| 74 | 2459 | 2412 | 2366 | 2319 | 2272 | 2225 | 2178 | 2131 | 2084 | 72.2037 | 16.0165 | 0375 | 05 | 07 | 1006 | 1216 | 1426 | 1636 | 1846 | 2056 | 74 |
| 75 | 2222 | 2175 | 2127 | 2080 | 2033 | 1985 | 1938 | 1890 | 1842 | $73 \cdot 1795$ | $16 \cdot 2330$ | 2543 | 275 | 2969 | 318 | 339 | 3607 | 38 | 40 | 4246 | 75 |
| 76 | 1985 | 1937 | 1889 | 1841 | 1793 | 1745 | 1697 | 1649 | 1600 | 74.1552 | 16.449 | 4710 | 4926 | 5142 | 535 | 5573 | 578 | 600 | 622 | 643 | 76 |
| 77 | 1748 | 1699 | 1651 | 1602 | 1553 | 1505 | 1456 | 1407 | 1358 | $75 \cdot 1309$ | $16 \cdot 6658$ | 6877 | 7096 | 7314 | 7533 | 775 | 7970 | 818 | 8407 | 862 | 77 |
| 78 | 1511 | 1462 | 1413 | 1363 | 1314 | 1265 | 1215 | 1166 | 1116 | $76 \cdot 1066$ | 16.8823 | 9044 | 9266 | 9487 | 9709 | 9930 | －152 | 0373 | 0595 | 0816 | 78 |
| 79 | 1274 | 1224 | 1174 | 1124 | 1074 | 1024 | 0974 | 0924 | 0874 | 77．0824 | 17.0987 | 1212 | 143 | 1660 | 1885 | 2109 | 2333 | 255 | 2782 | 3006 | 79 |
| 80 | 1037 | 0986 | 0936 | 0885 | 0835 | 0784 | 0733 | 0683 | 0632 | 78.0581 | 17.3152 | 3379 | 360 | 383 | 406 | 428 | 451 | 474 | 496 | 5196 | 80 |
| 81 | 0800 | 0749 | 0698 | 0647 | 0595 | 0544 | 0493 | 0441 | 0390 | 79．0338 | $17 \cdot 5316$ | 5546 | 5776 | 6006 | 6236 | 6466 | 6696 | 692 | 7156 | 7386 | 81 |
| 82 | 0563 | 0511 | 0459 | 0408 | 0356 | 0304 | 0252 | 0200 | 0148 | 80．0095 | 177480 | 7713 | 7946 | 8179 | 8412 | 8645 | 8877 | 911 | 9343 | 9576 | 82 |
| 83 | 0326 | 0273 | 0221 | 0169 | 0116 | 0064 | ＋011 | 9958 | 9905 | 80.9853 | 17.9645 | 9881 | ＋116 | 0352 | 0588 | 082 | 105 | 129 | 153 | 176 | 8 |
| 84 | 0089 | －036 | 9983 | 9930 | 9877 | 9823 | 9770 | 9717 | 9663 | 81.9610 | 18.1809 | 2048 | 228 | 2525 | 2763 | 3002 | 3240 | 3479 | 3717 | 3956 | 84 |
| 85 | 9852 | 9798 | 9744 | 9691 | 37 | 迷 | 9529 | 9475 | 9421 | 82.9367 | 18．3974 | 4215 | 4456 | 4698 | 4939 | 518 | 5422 | 566 | 59 | 6146 | 85 |
| 86 | 9615 | 9560 | 9506 | 9452 | 9397 | 9343 | 9288 | 9234 | 9179 | 83．9124 | 18.6138 | 6382 | 6627 | 6871 | 7115 | 7359 | 7603 | 784 |  | 833 |  |
|  | 9378 | 9323 | 9268 | 9213 | 9158 | 9103 | 9048 | 8992 | 8937 | 84：8882 | 18.8302 | 8550 | 8797 | 9044 | 9291 | 9538 | 9785 | －032 | 027 | 0525 | 8 |
| 88 | 9140 | 9085 | 9030 | 8974 | 8918 | 8863 | 8807 | 8751 | 8695 | 85.8639 | 19.0467 | 0717 | 0967 | 1217 | 1466 | 1716 | 1966 | 2216 | 246 | 2715 | 88 |
| 89 | 8903 | 8847 | 8791 | 8735 | 8679 | 8622 | 8566 | 8509 | 8453 | 86.8396 | 19.2631 | 2884 | 3137 | 3389 | 3642 | 3895 | 4147 | 4400 | 465 | 4905 | 89 |
| 90 | 866 | 8610 | 8553 | 8496 | 8439 | 8382 | 8325 | 8268 | 8211 | 87.8153 | 19.4796 | 5051 | 5307 | 5562 | 5818 | 6073 | 6329 | 6584 | 6840 | 7095 | 90 |
| 91 | 8429 | 8372 | 8315 | 8257 | 8200 | 8142 | 8084 | 8027 | 7969 | 88.7911 | 19.6960 | 7218 | 7477 | 7735 | 7994 | 8252 | 8510 | 8769 | 902 | 9285 | 91 |
| 92 | 8192 | 8134 | 8076 | 8018 | 7720 | 7902 | 7843 | 7785 | 7727 | 89.7668 | 19.9124 | 9386 | 9647 | 9908 | －169 | 0431 | 0692 | 0953 | 121 | 1475 | 92 |
| 93 | 7955 | 7897 | 7838 | 7779 | 7720 | 7662 | 7603 | 7544 | 7484 | 90．7425 | 20．1289 | 1553 | 1817 | 2081 | 2345 | 2609 | 2873 | 3137 | 340 | 3665 | 93 |
| 94 | 7718 | 7659 | 7600 | 7540 | 7481 | 7421 | 7362 | 7302 | 7242 | 917182 | $20 \cdot 3453$ | 3720 | 3987 | 4254 | 4521 | 4788 | 505 | 532 | 558 | 5855 | 94 |
| 9 | 748 | 7421 | 7361 | 7301 | 7241 | 7181 | 7121 | 7001 | 000 | 92.6940 | $20 \cdot 5618$ | 5887 | 6157 | 642 | 669 | 696 | 723 | 750 | 777 | 804 | 95 |
| 96 | 7244 | 7184 | 7123 | 7063 | 7002 | 6941 | 6880 | 6819 | 6758 | $93 \cdot 6697$ | 20.7782 | 8055 | 8327 | 8600 | 8872 | 9145 | 941 | 9690 | 996 | \＄23 | 96 |
| 97 | 7007 | 6946 | 6885 | 6824 | 6762 | 6701 | 6639 | 6578 | 6516 | 94．6454 | 20.9946 | －222 | 0497 | 0773 | 1048 | 1324 | 1599 | 1874 | 2150 | 2425 | 97 |
| 98 | 6770 | 6708 | 6647 | 6585 | 6523 | 6461 | 6398 | 6336 | 6274 | $95 \cdot 6211$ | $21 \cdot 2111$ | 2389 | 2667 | 2946 | 3224 | 3502 | 3780 | 405 | 4337 | 4615 | 98 |
|  | 6533 | 6471 | 6408 | 6346 | 6283 | 6220 | 6158 | 6095 | 6032 | 96.5969 | 21.4275 | 4556 | 4838 |  | 5400 | 5681 | 5962 | 6243 | 6524 | 6805 | 99 |
| 100 | 6296 | 6233 | 6170 | 6107 | 044 | 5980 | 5917 | 5853 | 5790 | 97.5726 | 21.6440 | 6724 | 7008 | 7292 | 7575 | 7859 | 8143 | 8427 | 8711 | 8995 | 100 |
|  | 30 | 29 | $28^{\prime}$ | 27 | ． 26 | 25 | $24^{\prime}$ | $23^{\prime}$ | $22^{\prime}$ | $21^{\prime}$ | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{1}$ | 26 | 25 | $24^{\prime}$ | $23^{\prime}$ | 22\％ | $21^{\prime}$ |  |
| 77 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $77^{\circ}$ |

TRAVERSE TABLES.

|  | - Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $12^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\prime}$ | $41^{\prime}$ | 42' | $\frac{43^{\prime}}{19755}$ | 44' | $45^{\prime}$ | $146^{\prime}$ | $47^{\prime}$ | $48^{\prime}$ | I | $40^{\prime}$ | $141^{\prime}$ | $42^{\prime}$ | $43^{\prime}$ | $44^{\prime}$ | $45^{\prime}$ | $46^{\prime}$ |  | $48^{\prime}$ | 49 |  |
|  | 975 | 9756 |  |  | 9754 | 975 | 97 | 97 | 97 | 9751 | 2193 | 2196 | 2198 | 2201 | 2204 | 2207 | 2210 | 2213 | 2215 | 18 |  |
|  | 951 | 9512 | 9511 | 9509 | 9508 | 950 | 95 | 950 | 9503 | 1.9502 | 4386 | 4391 | 4397 | 4403 | 44 | 4414 | 4420 | 4425 | 4431 | 4437 |  |
|  | 9270 | 9268 | 9266 | 9264 | 9262 | 9260 | 9258 | 9256 | 9254 | 2.9253 | 6578 | 6587 | 6595 | 6604 | 6612 | 6621 | 6629 | 6638 | 6646 | 6655 |  |
|  | 9026 | 9024 | 9021 | 9019 | 9016 | 9014 | 9011 | 9009 | 9006 | 3.9003 | 8771 | 8782 | 8794 | 8805 | 8817 | 8828 | 883 | 8851 | 8862 | 8873 |  |
| 5 | 5783 | 8780 | 8777 | 8774 | 8770 | 8767 | 8764 | 8761 | 8757 | 4.8754 | $1 \cdot 0964$ | 0978 | 0992 | 1007 | 1021 | 1035 | 1049 | 1063 | 1077 | 1092 |  |
| 6 | 8540 | 8536 | 8532 | 8528 | 8524 | 8521 | 8517 | 8513 | 8509 | $5 \cdot 8505$ | 13157 | 3174 | 3191 | 3208 | 3225 | 3242 | 3259 | 3276 | 3293 | 3310 | 6 |
| 7 | 8296 | 8292 | 8287 | 8283 | 8278 | 8274 | 8269 | 8265 | 8260 | 6.8256 | 1.5350 | 5369 | 5389 | 5409 | 5429 | 5449 | 5469 | 5489 | 5508 | 5528 |  |
|  | 8053 | 8048 | 8043 | 8038 | 8033 | 8027 | 8022 | 8017 | 8012 | 78007 | 17542 | 7565 | 7588 | 7610 | 7633 | 7656 | 7678 | 7701 | 7724 | 7747 |  |
|  | 7810 | 7804 | 7798 | 7792 | 7787 | 7781 | 7775 | 7769 | 7763 | 8.7758 | 1.9735 | 9761 | 9786 | 9812 | 9837 | 9863 | 9888 | 9914 | 9939 | 9965 |  |
| 10 | 7566 | 7560 | 7553 | 7547 | 7541 | 7534 | 7528 | 7521 | 7515 | 9.7508 | $2 \cdot 1928$ | 1956 | 1985 | 2013 | 2041 | 207 | 209 | 2126 | 2155 | 2183 | 10 |
| 11 | 7323 | 7316 | 7309 | 7302 | 7295 | 7288 | 7281 | 7274 | 7266 | 107259 | 2.4121 | 4152 | 4183 | 4214 | 424 | 42 | 4308 | 4339 | 4370 | 4402 | 11 |
| 12 | 7079 | 7072 | 7064 | 7056 | 7049 | 7041 | 7033 | 7026 | 7018 | 117010 | 2.6313 | 6347 | 6382 | 6416 | 6450 | 648 | 651 | 6552 | 6586 | 662 | 12 |
| 13 | 6836 | 6828 | 6819 | 6811 | 6803 | 6794 | 6786 | 6778 | 676 | 12.6761 | $2 \cdot 8506$ | 8543 | 8580 | 8617 | 8654 | 8691 | 8728 | 8764 | 8801 | 8838 | 3 |
| 14 | 6593 | 6584 | 6575 | 6566 | 6557 | 6548 | 6539 | 6530 | 6521 | 13.6512 | 3.0699 | 0739 | 0778 | 0818 | 0858 | 0898 | 093 | 0977 | 1017 | 105 | 14 |
| 15 | 6349 | 6340 | 6330 | 632 | 6311 | 6301 | 6292 | 6282 | 6272 | 14.6263 | 3.2892 | 2934 | 2977 | 3020 | 3062 | 3105 | 3147 | 3190 | 3232 | 3275 | 15 |
| 16 | 6106 | 6096 | 6086 | 6075 | 6065 | 6055 | 6044 | 6034 | 6024 | 15.6014 | $3 \cdot 5085$ | 5130 | 5175 | 5221 | 526 | 531 | 535 | 5402 | 48 | 5493 | 16 |
| 17 | 5863 | 5852 | 5841 | 5830 | 5819 | 5808 | 5797 | 5786 | 577 | 16.5764 | $3 \cdot 7277$ | 7326 | 7374 | 7422 | 7470 | 751 | 756 | 7615 | 7663 | 77 | 17 |
| 18 | 5619 | 5608 | 5596 | 5585 | 5573 | 5562 | 5550 | 5538 | 5527 | 17.5515 | 3.9470 | 9521 | 9572 | 9623 | 9674 | 972 | 977 | 9828 | 9879 | 9930 | 18 |
| 19 | 5376 | 5364 | 5352 | 5339 | 5327 | 5315 | 5303 | 5291 | 527 | 18.5266 | $4 \cdot 1663$ | 1717 | 1771 | 1825 | 1879 | 1933 | 1986 | 2040 | 2094 | 2148 | 19 |
| 20 | 5132 | 5120 | 5107 | 5094 | 5081 | 5068 | 5056 | 5043 | 5030 | 19.5017 | $4 \cdot 3856$ | 3912 | 3969 | 4026 | 4083 | 4139 | 4196 | 4253 | 4310 | 4366 | 20 |
| 21 | 4889 | 4876 | 4862 | 4849 | 4835 | 4822 | 4808 | 4795 | 478 | 204768 | 4.6049 | 6108 | 61 | 6227 | 628 | 6346 | 640 | 6466 | 25 | 6585 | 21 |
| 22 | 4646 | 4632 | 4618 | 4604 | 4589 | 4575 | 4561 | 4547 | 4533 | 21.4519 | 4.8241 | 8304 | 8366 | 8429 | 849 | 855 | 8616 | 8678 | 8741 | 880 | 22 |
| 23 | 4402 | 4388 | 4373 | 4358 | 4343 | 4329 | 4314 | 4299 | 4284 | 22.4270 | 5.0434 | 0499 | 0565 | 0630 | 0695 | 076 | 082 | 0891 | 0956 | 1021 | 23 |
| 24 | 4159 | 4144 | 4128 | $41 / 3$ | 4098 | 4082 | 4067 | 4051 | 4036 | $23 \cdot 4020$ | $5 \cdot 2627$ | 2695 | 2763 | 2831 | 2899 | 296 | 303 | 3104 | 3172 | 3240 | 24 |
| 25 | 391 | 3900 | 3884 | 3868 | 3852 | 3836 | 820 | 3803 | 3787 | 24.3771 | 5.4820 | 4891 | 4962 | 5033 | 5103 | 5174 | 5245 | 5316 | 5387 | 5458 | 25 |
| 26 | 3672 | 3656 | 3639 | 3622 | 3606 | 3589 | 3572 | 3556 | 3539 | 25-3522 | 5.7012 | 7086 | 71 | 7234 | 7308 | 738 | 745 | 75 | 7603 | 767 | 26 |
| 27 | 3429 | 3412 | 3394 | 3377 | 3360 | 3342 | 3325 | 3308 | 3290 | $26 \cdot 3273$ | 5.9205 | 9282 | 93 | 9435 | 951 | 958 | 966 | 9741 | 9818 | 989 | 27 |
| 28 | 3185 | 3168 | 3150 | 3132 | 3114 | 3096 | 3078 | 3060 | 3042 | $27 \cdot 3024$ | 6.1398 | 1477 | 1557 | 1636 | 1716 | 179 | 187 | 1954 | 2034 | 2113 | 28 |
| 29 | 2942 | 2924 | 2905 | 2886 | 2868 | 2849 | 2831 | 2812 | 2793 | 28.2775 | 6.3591 | 3673 | 3755 | 3838 | 3920 | 4002 | 408 | 4167 | 4249 | 433 | 29 |
| 30 | 2699 | 2680 | 2660 | 2641 | 2622 | 2603 | 2583 | 2564 | 2545 | 29.2525 | 6.5784 | 5869 | 5954 | 6039 | 6124 | 6209 | 629 | 6379 | 6465 | 6550 | 30 |
| 31 | 2455 | 2436 | 2416 | 2396 | 237 | 235 | 2336 | 2316 | 2296 | 30.2276 | 6.7 | 8064 | 8152 | 824 | 332 | 841 | 850 | 85 | 8680 | 8768 | 31 |
| 32 | $22 / 2$ | 2192 | 2171 | 2151 | 2130 | 2110 | 2089 | 2068 | 2048 | 31.2027 | 7.0169 | 0260 | 0351 | 0442 | 0532 | 0623 | 071 | 0805 | 0896 | 09 | 32 |
| 33 | 1969 | 1948 | 1926 | 1905 | 1884 | 1863 | 1842 | 1821 | 1799 | $32 \cdot 1778$ | 7.2362 | 2456 | 2549 | 2643 | 2737 | 283 | 292 | 3017 | 3111 | 320 | 33 |
| 34 | 1725 | 1703 | 1682 | 1660 | 1638 | 1616 | 1595 | 1573 | 1551 | 33'1529 | 74555 | 4651 | 4748 | 4844 | 4941 | 503 | 513 | 5230 | 5326 | 542 | 34 |
| 35 | 1482 | 1459 | 1437 | 1415 | 1392 | 70) | 47 | 25 | 1302 | 34.1280 | 7•6748 | 6847 | 946 | 046 | 145 | 224 | 734 | 744 | 54 | 7641 | 35 |
| 36 | 1238 | 1215 | 1192 | 1169 | 1146 | 1123 | 1100 | 1077 | 1054 | 35.103! | $7 \cdot 8940$ | 9042 | 9145 | 9247 | 9349 | 9451 | 955 | 9655 | 9757 | 9860 | 36 |
| 37 | 0995 | 0971 | 0948 | 0924 | 0900 | 0877 | 0853 | 0829 | 0805 | $36^{\circ} 078$ | 8.113 | 1238 | 1343 | 1448 | 1553 | 1658 | 176 | 1868 | 1973 | 2078 | 37 |
| 38 | 0752 | 0727 | 0703 | 0679 | 0654 | 0630 | 0606 | 0581 | 0557 | 37.0532 | 8.3326 | 3434 | 3542 | 3649 | 3757 | 386 | 3973 | 4081 | 4188 | 429 | 38 |
| 39 | 0508 | 0483 | 0458 | 0434 | 0409 | 0383 | 0358 | 0333 | 0308 | 38.0283 | 8.5519 | 5629 | 5740 | 5851 | 5961 | 6072 | 618 | 6293 | 6404 | 651 | 39 |
| 40 | 0265 | 0239 | 0214 | 0188 | 0163 | 0137 | 0111 | 0086 | 0060 | 39.0034 | 8.7711 | 7825 | 7938 | 8052 | 8165 | 8279 | 8392 | 8506 | 8619 | 8733 | 40 |
| 41 | 1022 | 99 | 9969 | 9943 | 9917 | 9890 | 9864 | 9838 | 81 | 39 | 8.9904 | -0 | 01 | 0253 | 0370 | 0486 | 0602 | 0719 | 35 | 0951 | 41 |
| 42 | 9778 | 9751 | 9724 | 9698 | 9671 | 9644 | 9617 | 9590 | 9563 | 40.953 | 9.2097 | 2216 | 2335 | 2455 | 2574 | 269 | 281 | 293 | 3050 | 316 | 42 |
| 43 | 9535 | 9507 | 9480 | 9452 | 9425 | 9397 | 9370 | 9342 | 9314 | 41.928 | 9.4290 | 4412 | 4534 | 4656 | 4778 | 4900 | 5022 | 5144 | 5266 | 538 | 43 |
| 44 | 9291 | 9263 | 9235 | 9207 | 9179 | 9151 | 9122 | 9094 | 9066 | 42.9037 | 9.6483 | 6607 | 6732 | 6857 | 6982 | 7107 | 723 | 7357 | 7481 | 760 | 44 |
| 45 | 904 | 9019 | 91 | 62 | 8933 | 8904 | 8875 | 8846 | 8817 | 43.8788 | 867 | 8803 | 893 | 059 | 918 | 931 | 94 | 95 | 9697 | 982 | 45 |
| 46 | 8805 | 8775 | 8746 | 8716 | 8687 | 8657 | 8628 | 8598 | 8569 | 44.8539 | 10.0868 | 0999 | 1129 | 1260 | 1390 | 1521 | 165 | 1782 | 1912 | 2043 | 46 |
| 47 | 8561 | 8531 | 8501 | 8471 | 8441 | 8411 | 8381 | 8350 | 8320 | 45'8290 | 10.3061 | 3194 | 3328 | 3461 | 3594 | 3728 | 386 | 3994 | 4128 | 426 | 47 |
| 48 | 8318 | 8287 | 8257 | 8226 | 8195 | 8164 | 8133 | 8103 | 8072 | 46.8041 | 10.5254 | 5390 | 5526 | 5662 | 5799 | 5935 | 607 | 6207 | 6343 | 647 | 48 |
| 49 | 8075 | 8043 | 8012 | 7981 | 7949 | 7918 | 7886 | 7855 | 7823 | 47.7792 | 10.744 | 7586 | 7725 | 7864 | 8003 | 8142 | 8281 | 8420 | 8559 | 8698 | 49 |
| 50 | 7831 | 7799 | 7767 | 7735 | 7703 | 7671 | 639 | 7607 | 7575 | 48.7542 | 10.9639 | 9781 | 9923 | -065 | 0207 | 0349 | 0491 | 0632 | 0774 | 0916 | 50 |
| 51 | 7588 | 755 | 752 | 7490 | 17457 | 425 | 92 | 7359 | 7326 | 49 | 11.1832 | 197 | 21 | 22 | 241 | 25 | 27 | 2845 | 980 | 3134 | 51 |
| 52 | 7344 | 7311 | 7278 | 7245 | 7211 | 7178 | 7145 | 7111 | 7078 | 50.70 | 114025 | 4172 | 4320 | 4468 | 4615 | 476 | 491 | 5058 | 5205 | 535 | 52 |
| 53 | 7101 | 7067 | 7033 | 6999 | 6965 | 6931 | 6897 | 6863 | 6829 | 51.6795 | 11.6218 | 6368 | 6518 | 6669 | 6819 | 6970 | 7120 | 7270 | 7421 | 757 | 53 |
| 54 | 6858 | 6823 | 6789 | 6754 | 6720 | 6685 | 6650 | 6615 | 6581 | 52.6546 | 11.8410 | 8564 | 8717 | 8870 | 9023 | 9177 | 9330 | 9483 | 9636 | 9789 | 5 |
| 55 | 6614 | 6579 | 6544 | 6509 | 6474 | 643 | 6403 | 6368 | 6332 | 53.6297 | 12.0603 | 0759 | 0915 | 107 | 122 | 138 | 154 | 1696 | 1852 | 2008 | 55 |
| 56 | 6371 | 6335 | 6299 | 6264 | 6228 | 6192 | 6156 | 6120 | 6084 | 54.6048 | 12.2796 | 2955 | 3114 | 3273 | 3432 | 3591 | 3749 | 3908 | 4067 | 4226 | 56 |
| 57 | 6128 | 6091 | 6055 | 6018 | 5982 | 5945 | 5909 | 5872 | 5835 | 55.5798 | 12.4989 | 5151 | 5312 | 5474 | 5636 | 5798 | 5959 | 6121 | 6283 | 6444 | 57 |
| 58 | 5884 | 5847 | 5810 | 5773 | 5736 | 5699 | 5661 | 5624 | 5587 | 56.5549 | $12 \cdot 7182$ | 7346 | 7511 | 7675 | 7840 | 8004 | 8169 | 8334 | 8498 | 8663 | 58 |
| 59 | 5641 | 5603 | 5565 | 5528 | 5490 | 5452 | 5414 | 5376 | 5338 | 57.5300 | 12.9374 | 9542 | 9709 | 9877 | -044 | 0211 | 0379 | 0546 | 0714 | 0881 | 59 |
| 60 | 5397 | 5359 | 5321 | 5282 | 5244 | 205 | 5167 | 128 | 090 | $58 \cdot 5051$ | 13.1567 | 1737 | 1908 | 2078 | 2248 | 2418 | 258 | 27 | 2929 | 3099 | 50 |
|  | 515 | 5115 | 5076 | 5037 | 4998 | 4959 | 4920 | 4880 | 4841 | 59.4802 | 13.3760 | 3933 | 4106 | 4279 | 4452 | 4625 | 479 | 4972 | 145 |  | 61 |
| 62 | 4911 | 4871 | 4831 | 4792 | 4752 | 4712 | 4672 | 4633 | 4593 | 60.4553 | 13.5953 | 6129 | 6305 | 6481 | 6656 | 6832 | 7008 | 7184 | 7360 | 7536 | 62 |
| 63 | 4667 | 4627 | 4587 | 4546 | 4506 | 4466 | 4425 | 4385 | 4344 | 61.4303 | 13.8146 | 8324 | 8503 | 8682 | 8861 | 9039 | 9218 | 9397 | 9576 | 9754 | 63 |
| 64 | 4424 | 4383 | 4342 | 4301 | 4260 | 4219 | 4178 | 4137 | 4096 | 62.4054 | 14.0338 | 0520 | 0702 | 0883 | 1065 | 1246 | 142 | 1609 | 1791 | 1973 | 64 |
| 65 | 4180 | 4139 | 4097 | 405 | 401 | 397 | 3931 | 3889 | 3847 | $63 \cdot 38$ | 14.2531 | 271 | 2900 | 3085 | 3269 | 345 | 363 | 382 | 400 | 419 | 65 |
| 66 | 3937 | 3895 | 3853 | 3811 | 3768 | 3726 | 3684 | 3641 | 3599 | 64.3556 | 14.4724 | 4911 | 5098 | 5286 | 5473 | 5660 | 5848 | 6035 | 6222 | 6409 | 66 |
| 67 | 3694 | 3651 | 3608 | 3565 | 3522 | 3479 | 3436 | 3393 | 3350 | 65.3307 | 14.6917 | 7107 | 7297 | 7487 | 7677 | 7867 | 805 | 247 | 37 | 62 | 67 |
| 68 | 3450 | 3407 | 3363 | 3320 | 3276 | 3233 | 3189 | 3145 | 3102 | 66.3058 | 14.9109 | 9302 | 9495 | 9688 | 9881 | -074 | 0267 | 0460 | 0653 | 0846 | 68 |
| 69 | 3207 | 3163 | 3119 | 3075 | 3030 | 2986 | 2942 | 2898 | 2853 | $67 \cdot 2809$ | $15 \cdot 1302$ | 1498 | 1694 | 1890 | 2085 | 2281 | 247 | 2673 | 2868 | 306 | 69 |
| 70 | 2964 | 2919 | 2874 | 829 | 2785 | 2740 | 2695 | 2650 | 2605 | $68 \cdot 2559$ | 15.3495 | 3694 | 3892 | 4091 | 4290 | 4488 | 468 | 4885 | 508 | 528 | 20 |
|  | 2720 | 2675 | 29 | 2584 | 2539 | 2493 | 2447 | 2402 | 2356 | 69.2310 | 15.5688 | 5889 | 6091 | 6292 | 6494 | 6695 | 689 | 7098 | 7299 | 7501 | 71 |
| 72 | 2477 | 2431 | 2385 | 2339 | 2293 | 2246 | 2200 | 2154 | 2108 | $70 \cdot 2061$ | 157881 | 8085 | 8289 | 8494 | 8698 | 8902 | 9106 | 9311 | 9515 | 9719 | 72 |
| 73 | 2233 | 2187 | 2140 | 2094 | 2047 | 2000 | 1953 | 1906 | 1859 | 71.1812 | 16.0073 | 0281 | 0488 | 0695 | 0902 | 1109 | 1316 | 1523 | 1730 | 1937 | 73 |
| 74 | 1990 | 1943 | 1896 | 1848 | 1801 | 1753 | 1706 | 1658 | 1611 | 72.1563 | 16.2266 | 2476 | 2686 | 2896 | 3106 | 3316 | 3526 | 3736 | 3946 | 4156 | 74 |
| 75 | 1747 | 1699 | 1651 | 1603 | 1555 | 1507 | 1459 | 1410 | 1362 | 73.1314 | 16.4459 | 4672 | 4885 | 5098 | 5310 | 5523 | 5736 | 5949 | 6161 | 6374 | 75 |
| 76 | 1503 | 1455 | 1406 | 1358 | 1309 | 1260 | 1211 | 1162 | 1114 | 74.1065 | 16.6652 | 6867 | 7083 | 7299 | 7514 | 7730 | 7946 | 8161 | 8377 | 8592 | 76 |
| 77 | 1260 | 1211 | 1162 | 1172 | 1063 | 1014 | 0964 | 0915 | 0865 | 75.0815 | $16 \cdot 8845$ | 9063 | 9282 | 9500 | 97 | 9937 | -15 | 0374 | 0592 | , | 77 |
| 78 | 1017 | 0967 | 0917 | 0867 | 0817 | 0767 | 0717 | 0667 | 0617 | 76.0566 | 17•1037 | 1259 | 1480 | 1701 | 1923 | 2144 | 2365 | 2587 | 2808 | 3029 | 78 |
| 79 | 0773 | 0723 | 0672 | 0622 | 0571 | 0520 | 0470 | 0419 | 0368 | $77 \cdot 0317$ | 17.3230 | 3454 | 3678 | 3903 | 4127 | 4351 | 4575 | 4799 | 5023 | 5247 | 79 |
| 80 | 0530 | 0479 | 0428 | 0376 | 0325 | 0274 | 0222 | 0171 | 0120 | 78.0068 | 17.5423 | 5650 | 5877 | 6104 | 6331 | 6558 | 678 | 7012 | 7239 | 746 | 80 |
| 81 | 0286 | 0235 | 0183 | 0131 | 0079 | -027 | 9975 | 9923 | 9871 | 78.9819 | $17 \cdot 7616$ | 7846 | 8075 | 8305 | 8535 | 8765 | 8995 | 9224 | 9454 | 9684 | 81 |
| 82 | -043 | 9991 | 9938 | 9886 | 9833 | 9781 | 9728 | 9675 | 9623 | 79.9570 | 17.9808 | - 041 | 0274 | 0507 | 0739 | 0972 | 1205 | 1437 | 1670 | 1902 | 82 |
| 83 | 9800 | 9747 | 9694 | 964 | 9587 | 9534 | 9481 | 9427 | 9374 | 80.9320 | 182001 | 2237 | 2472 | 2708 | 2943 | 3179 | 3414 | 3650 | 3885 | 412 | 83 |
| 84 | 9556 | 9503 | 9449 | 939 | 9341 | 9288 | 9234 | 9180 | 9125 | 81-9071 | 18.4194 | 4432 | 4671 | 4909 | 5148 | 5386 | 5624 | 5862 | 6101 | 6339 | 8 |
| 85 | 9313 | 9259 | 9204 | 50 | 9096 | 9041 | 8986 | 8932 | 87 | $82 \cdot 8822$ | 18.6387 | 6628 | 686 | 711 | 7352 | 759 | 7834 | 8075 | 8316 | 8557 | 85 |
| 86 | 9070 | 9015 | 8960 | 8905 | 8850 | 8794 | 8739 | 8684 | 8628 | $83 \cdot 8573$ | 18.8580 | 8824 | 9068 | 9312 | 9556 | 9800 | +044 | 0288 | 0532 | 078 | 86 |
| 87 | 8826 | 8771 | 8715 | 8659 | 8604 | 8548 | 8492 | 8436 | 8380 | 84:8324 | 19.0772 | 1019 | 1266 | 1513 | 1760 | 2007 | 2254 | 2500 | 2747 | 2994 | 87 |
| 88 | 8583 | 8527 | 8470 | 8414 | 8358 | 8301 | 8245 | 8188 | 8131 | $85 \cdot 8075$ | 19.2965 | 3215 | 3465 | 3714 | 3964 | 4214 | 4463 | 4713 | 4963 | 5212 | 8 |
| 89 | 8339 | 8283 | 226 | 8169 | 812 | 8055 | 7998 | 7940 | 7883 | $86 \cdot 7826$ | 19.5158 | 5411 | 5663 | 5916 | 6168 | 6421 | 6673 | 6926 | 7178 | 74 | 89 |
| 90 | 8096 | 8039 | 7981 | 7924 | 7866 | 7808 | 7750 | 7692 | 7634 | $87 \cdot 7576$ | 19.7351 | 7606 | 7862 | 8117 | 8372 | 862 | 888 | 9138 | 9394 | 964 | 90 |
| 91 | 7853 | 7795 | 7736 | 7678 | 7620 | 7561 | 7503 | 7445 | 7386 | 887327 | 19.9544 | 9802 | ${ }^{+060}$ | 0318 | 0576 | 0835 | 1093 | 1351 | 1609 | 186 | 91 |
| 92 | 7609 | 7551 | 7492 | 7433 | 7374 | 7315 | 7256 | 7197 | 7137 | 89-7078 | 20.1736 | 1997 | 2259 | 2520 | 2781 | 3042 | 3303 | 3564 | 3825 | 408 | 92 |
| 93 | 7366 | 7307 | 7247 | 7188 | 7128 | 7068 | 7009 | 6949 | 6889 | 90.6829 | 20.3929 | 4193 | 4457 | 4721 | 4985 | 5249 | 5512 | 5776 | 6040 | 630 | 93 |
| 94 | 7123 | 7063 | 7002 | 6942 | 6882 | 6822 | 6761 | 6701 | 6640 | 91.6580 | $20 \cdot 6122$ | 6389 | 6655 | 6922 | 7189 | 7456 | 7722 | 7989 | 8256 | 8522 | 94 |
| 95 | 6879 | 819 | 源 | 6697 | 6636 | 6575 | 6514 | 6453 | 6392 | $92 \cdot 6331$ | 20.8315 | 8584 | 8854 | 9124 | 9393 | 9663 | 9932 | +202 | 0471 | 0740 | 95 |
| 96 | 6636 | 6575 | 6513 | 6452 | 6390 | 6329 | 6267 | 6205 | 6143 | 93.6082 | 21.0507 | 0780 | 1052 | 1325 | 1597 | 1870 | 2142 | 2414 | 2687 | 2959 | 96 |
| 97 | 6392 | 6331 | 6268 | 6206 | 6144 | 6082 | 6020 | 5957 | 5895 | 94.5832 | $21 \cdot 2700$ | 2976 | 3251 | 3526 | 3801 | 4076 | 4352 | 4627 | 4902 | 5177 | 97 |
| 98 | 6149 | 6087 | 6024 | 5961 | 5898 | 5835 | 5773 | 5710 | 5646 | 95.5583 | 21.4893 | 5171 | 5449 | 5727 | 6005 | 6283 | 6561 | 6840 | 7118 | 7395 | 98 |
|  | 㖪 | 5843 | 5779 | 5716 | 5652 | 5589 | 5525 | 5462 | 5398 | 96.5334 | 21.7086 | 7367 | 7648 | 7929 | 8210 | 8490 | 8771 | 9052 | 9333 | 9614 | 99 |
| 100 | 5662 | 5599 | 5535 | 5471 | 5407 | 5342 | 5278 | 5214 | 5149 | 97.5085 | 21.9279 | 9562 | 9846 | -130 | 0414 | 0697 | 0981 | 1265 | 1549 | 1832 | 100 |
|  | $20^{\prime}$ | 19 | $18^{\prime}$ | $17^{\prime}$ | $16^{6}$ | $15^{\prime}$ | $14^{\prime}$ | $13^{\prime}$ | $12^{\prime}$ | 111 | $20^{\prime}$ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | 16 | $15^{\prime}$ | $14^{\prime}$ | $13^{\prime}$ | i2' |  |  |
| 77 |  |  |  |  | Si |  |  |  |  |  |  |  |  |  |  | NE. |  |  |  |  | $7{ }^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES.

|  |  |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  | $\left.0^{0}\right\|^{1}\left\|2^{\prime}\right\|$ |  |  |  | $4^{4} 1$ |  | ${ }^{6} 17$ | $7^{7}+8^{8} \square^{9}$ |  |  |  |
|  | ${ }^{97446}$ |  | ${ }_{948}^{974}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 9227 |  | ${ }^{9223}$ |  |  |  |  |  |  | 57 | ${ }^{5766}$ | $\begin{gathered} 474 \\ 7429 \\ 720 \end{gathered}$ | , |  |  |  |  |  |  |
|  |  | 8972 |  | 8897 |  | ${ }^{8962} 88$ | ${ }_{8699} 885$ |  |  |  |  |  | 1276 | 32 |  |  |  |  |  |  |  |
|  |  | ${ }_{8}^{8858}$ |  | [8490 | ${ }^{884668}$ | ${ }_{8}^{8843} 8$ | 83939 | ${ }^{8835}$ | 169 | 5.88 | . 34 | ${ }^{3514}$ | ${ }^{3539} 5$ | ${ }^{3548}$ | ${ }^{3565}$ | 退3882 | ${ }_{5896}^{359}$ | 516 |  |  |  |
|  |  |  | ${ }^{8197} 7$ |  |  |  |  |  |  |  |  |  |  |  | $\begin{aligned} & 826 \\ & 087 \\ & 087 \end{aligned}$ |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 181 | ${ }^{7174}$ | 7166 | 7159 | 7152 | 7145 |  | 7130 | ${ }^{723}$ |  |  | 1776 | 488 | 4838 | 489 | 14900 |  | 4963 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | (13 |  |  |  |  | ${ }_{6368}^{6625}$ |  |  | ${ }_{6}^{6380}$ |  |  |  | 157 |  |  |  |  |  |  |  |  |
|  | ${ }^{4} 56156$ | 6146 | 6136 | 6126 | 16116 | 6106 | 6096 | 6087 |  |  | 3:3 |  |  | 3870 | 3913 | 3955 | 3998 | 4040 | 4083 |  |  |
|  |  |  | ${ }^{5878}$ |  |  |  |  | 5826 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 17 \\ & 18 \end{aligned}$ |  |  | 562 |  | 55988 | 5587 | 5576 | 5536 |  |  |  |  | ${ }^{8338}$ |  |  |  |  |  |  |  |  |
|  | ${ }_{9}{ }_{513}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | (12) | ${ }_{4}^{4364} 4$ | 4333 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 23 \\ & 23 \\ & 24 \end{aligned}$ | ${ }^{3} 4105$ |  | 4035 |  |  |  | 4014 |  |  |  |  |  | 189 | 134 |  |  |  |  |  |  |  |
|  |  | 393, |  |  | ${ }_{35}^{37}$ | ${ }_{3510}^{3770}$ | ${ }_{3694}^{3754}$ | ${ }^{37388}$ | ${ }_{3661}^{3723}$ | 24.3 |  | ${ }_{630}^{405}$ | ${ }_{637}^{426}$ | 4 | ${ }^{4} 52$ |  |  |  |  |  |  |
|  | 63336 |  | 3302 | 3285 | 3268 | 3251 | 3234 |  | 3199 |  |  | 18561 | ${ }^{863}$ | 8708 | 8782 | 18856 | 29 | 03 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 22 | 177 | 175 | 1735 | 1714 |  |  | 1651 |  |  |  |  |  |  | 886 | ${ }^{10174}$ | 528 | 519 |  |  |  |
|  | 154 | 152 | 149 | 1477 | 1456 | 1434 | 1415 | 1390 |  |  |  |  | ${ }^{4821}$ | 4514 |  |  |  |  |  |  |  |
|  | ${ }_{1030}$ | 1007 |  | ${ }_{0961}$ |  |  |  |  |  |  |  |  | 67 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 80261 | ${ }^{233}$ |  | 04 |  | ${ }^{1336}$ | 0, | 0086 | ${ }^{032}$ |  |  | ${ }_{5}^{3388}$ | 54 | ${ }_{580}^{348}$ |  | 6220 |  | 3236 | ${ }_{6343}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 19492 | 9465 | 9438 |  |  |  |  | ${ }^{930}$ |  |  |  | ${ }^{2346}$ | 2462 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 869 |  | 8885 | 86 | ${ }^{88588}$ | ${ }^{8849}$ | ${ }_{8520}^{8781}$ | ${ }_{84}^{87}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 8437 |  | 8378 | 8348 | 8319 | 828 | 8260 | 8230 |  | ${ }^{0} 1228$ |  | 1483 | 1611 | 173 | 1866 | 1993 | 2121 |  |  |  |
|  |  |  | $8150$ |  |  |  | 8029 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 887994 | ${ }_{7666} 72$ |  | 786 | 787 | ${ }_{7540}^{7800}$ | 75 | ${ }_{7477}^{7738}$ | ${ }_{7}^{7745}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 99744 | 7408 | 737 | ${ }^{3} 345$ |  | 7281 | ${ }_{6}^{7248}$ |  |  |  |  |  | 050 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }_{6}^{6312}$ |  | 6 | ${ }^{62718}$ | ${ }_{593}^{6242}$ |  | 6911 |  |  |  |  | ${ }^{9524} 178$ |  |  | ${ }_{2239}^{9975}$ | ${ }_{239}^{* 129}$ | 2545 |  |  |  |
|  |  |  | 5831 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 55971 | ${ }_{53}^{561}$ | ${ }_{5316}^{5374}$ | 52 | ${ }_{5241}^{5500}$ | ${ }_{5204}^{5463}$ | ${ }_{5166}^{5427}$ |  |  |  |  | ${ }_{8384}^{613}$ | ${ }_{8545}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{462}^{4872}$ | ${ }_{488}^{484}$ | ${ }_{4543}^{480}$ | ${ }_{4504}^{4762}$ | ${ }_{465}^{4724}$ | ${ }_{445}^{4685}$ | ${ }_{4}^{4646}$ | ${ }_{4346}^{4607}$ |  |  | 13.4 |  | 53 |  |  |  |  |  |  |  |  |
|  | ${ }^{436}$ | 438 | 42 | ${ }^{42468}$ |  |  | 41 |  |  |  |  |  |  |  |  | 8084 | ${ }^{8257}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 359 | 355 | 351 | 3471 | 3429 | 3387 | 334 | 330 | 32 |  |  | 41 |  |  |  | 487 |  | ${ }_{523}$ | 541 |  |  |
|  |  | 329 |  | 3213 | 3170 | 3127 | 3084 | 3042 | 299 | 63.25 | 1462 |  | 658 |  |  |  |  |  |  |  |  |
|  |  |  |  | 2954 |  | ${ }^{2868}$ | ${ }^{2824}$ | 2781 | ${ }^{2737}$ |  | 488 | ${ }^{86}$ | 8842 |  |  |  |  |  |  |  |  |
|  | ${ }^{85}{ }^{282}$ | 258 | ${ }_{2483}^{243}$ | 2438 |  | 23 | 23 |  |  |  |  |  |  |  |  |  |  |  | 4508 |  |  |
|  |  |  |  | 2180 |  |  |  | 1799 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 11803 | 175 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | $1{ }^{123}$ | ${ }^{12985}$ | 1033 | 188 | ${ }_{0} 840$ |  | 002 |  |  | ${ }_{7} 71.085$ | ${ }^{16.4274}$ |  | ${ }_{6883}^{4628}$ |  | ${ }^{230}$ |  |  |  |  |  |  |
|  |  |  | 0679 | 0630 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 0422 |  |  |  | 02 |  |  |  |  | 1178 |  |  |  |  |  |  |  |  |  |
|  |  | 02 | 01 | 0114 | 08 | -0 |  |  |  |  |  |  | ${ }^{364}$ |  |  |  |  |  |  |  |  |
|  |  |  | 9649 |  | 9545 |  | 944 |  |  |  |  |  | 815 | ${ }^{838}$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8983 | 89 | 8876 | 8822 | 87 | 4 | 8 |  |  |  |  |  |  |  |  |  |  |  | ${ }_{6319}$ |  |  |
|  | ${ }^{8727} 84$ |  |  | 8,8564 <br> 836 | ${ }_{8250}^{8509}$ | ${ }_{8195}^{8455}$ | ${ }_{8140}^{8400}$ | ${ }_{\substack{8345 \\ 8084}}^{\text {804 }}$ | (8292 |  |  |  |  |  |  |  | 8128 |  |  |  |  |
|  | 8215 |  |  | 8047 | 7992 | 7936 |  | 782 | , | 82 | 19.12 | 144 |  |  |  |  |  |  |  |  |  |
|  | 77788 | 796 | ${ }_{788}^{784}$ | 775 | ${ }_{7474}^{773}$ | 7416 | 76 |  |  |  |  | ${ }_{595}^{3702}$ | ${ }^{3345}$ | ${ }_{647} 6$ |  |  |  | ${ }^{51634}$ | 7680 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7189 |  |  |  | ${ }^{5956}$ |  |  |  |  |  |  | 0459 | 2711 |  |  |  |  |  |  |  |  |
|  | 6677 | ${ }^{661}$ | -6557 | ${ }^{6498}$ | ${ }^{66438}$ | ${ }^{6378}$ | ${ }^{6318}$ | ${ }^{6258}$ | 6198 |  |  | 4963 | 5221 |  |  |  | 6253 |  |  |  |  |
|  |  |  |  |  |  |  | 6058 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5908 | 5846 | 5785 |  |  | 559 | 5537 | 5475 | 541 |  |  | 172 | 198 | 2253 |  | 2786 |  |  | 3385 |  |  |
|  | 5652 | 558 |  |  |  | 5340 | 527 | 5215 | 5152 | 2 | $1 \cdot 37$ | 3973 | 424 | 4511 |  |  |  | 5588 | 857 |  |  |
|  |  | 533 | 5268 | 5206 | 5143 | 5080 | 501 | 4954 | 4889 |  |  | ${ }^{622}$ |  | ${ }^{6769}$ |  |  |  |  |  |  |  |
|  | 483 | ${ }_{4819} 5$ | 4754 | 4680 | 4684 | ${ }_{4561}^{4821}$ | 4496 | 4432 | ${ }_{436}^{46}$ |  |  | 0730 |  | 1285 | 1563 | 1841 | 2118 | 2396 |  |  |  |
|  |  | ${ }_{4352}^{458}$ |  |  | 4367 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 56 | ${ }^{55}$ |  |  |  | 51 |  |  |  |  |  | ${ }^{55^{\prime}}$ |  |  | $5{ }^{5}$ 1 5 | $51^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| Cosine． |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $13^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 11 | 12 | $13^{\prime}$ | $14^{\prime}$ | 15 | $16^{\prime}$ | $17^{\prime}$ |  | 19 |  | $11^{\prime}$ | $12^{\prime}$ | $13^{\prime}$ | 14 | $15^{\prime}$ |  |  |  |  |  |
|  | 9737 | 9736 | 9736 | 97 | 973 | 973 | 97 | 97 | 973 | ．973 | 227 | 228 | 22 | 22 | 2289 | 2292 | 2295 | 2298 | 2300 |  |  |
|  | 9474 | 9473 | 9472 | 947 | 948 | 94 | 94 |  |  | 1.9 | 4556 | 45 | 45 | 457 | 457 | 45 | 4590 | 4595 | 4601 |  |  |
|  | 9211 | 9209 | 9207 | 9205 | 9203 | 9201 | 9199 | 9197 | 919 | $2 \cdot 9$ | 6834 | 6842 | 685 | 6859 | 6868 | 687 | 68 | 6893 | 690 | 691 |  |
|  | 3948 |  | 894 |  | 38 | 8935 | 8933 | 103 | 892 |  | 11 | 9123 | 9134 | 9145 | 9157 | 9168 | 9179 | 9191 | 9202 | 9213 |  |
| 5 | 686 | 8682 | 8679 | 867 |  | 8669 |  |  | 8659 | 4.8656 | 138 | 1403 | 1418 | 43 | 1446 | 1460 | 147 | 1488 | 1502 | 151 |  |
|  | 8423 | 8419 | 8415 | 8411 | 8407 | 8403 | 8399 | 8395 | 839 | 5.8387 | －3667 | 3684 | 3701 | 3718 | 3735 | 3752 | 3769 | 3786 | 3803 | 3820 |  |
|  | 8160 | 8155 | 815 | 814 | 814 | 8137 | 81 |  |  |  |  |  | 5985 |  | 60 | 6044 | 60 | 6084 |  | 612 |  |
|  | 893 | 7892 | 78 |  | 78 | 78 |  | 78 | 785 | $7 \cdot 784$ | 8223 | 8245 |  | 82 | 8313 | 8336 | 8359 | 8381 | A | 8427 |  |
|  | 7634 | 7628 | 7622 | 7616 | 10 | 7604 | 753 | 75 | 758 | 8.7580 | ， | 0526 | 0552 | 0577 | 0603 | 0628 | 0654 | 067 | 0704 | 0730 |  |
| 10 | 7371 |  | 7358 | 7351 | 7345 | 7338 | 7331 | 7325 | 7318 | － 7 | 78 | 280 | 283 | 28 | 289 | 292 | 2948 | 2977 | 3005 | 303 | 10 |
| 11 | 7108 | 7101 | 7094 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 |
| 12 | 684 | 6837 | 682 | 682 | 6814 | 6806 | 6798 | 6789 | 678 |  | 3 |  |  |  | 470 | 7504 | 7538 | 7572 |  |  |  |
| 13 | 6583 | 6574 | 65 | 6557 | 6548 | 653 | 6531 | 652 | 6513 | 12. | 2961 | 96 | 96 | 9722 | 9759 | 979 | 98 | 98 |  | 9943 | 13 |
| 14 | 632 | 6310 | 630 | 629 | 623 | 6273 | 6264 | 625 | 624 | $13 \cdot 62$ |  | 19 | 19 | 2009 | 2048 | 2088 | 212 | 216 | 2207 | 224 |  |
| 15 | 6057 | 6047 | 6037 | 60 | 6017 | 6007 | 97 | 5987 | 597 | 14.5 | 4168 | 4210 | 4253 | 4295 | 4338 | 4380 | 4423 | 4465 | 450 | 4550 | 15 |
| 16 | 57 | 57 | 57 | 5762 | 5751 | 5741 | 5730 | 5719 | 5709 | 15.5698 | 3.6446 | 6491 | 6536 | 6581 | 6627 | 6672 | 6717 | 6763 | 6808 | 6853 | 16 |
| 17 | 5 |  | 5508 |  |  |  |  | 5452 |  | 16 | 3.87 | 87 |  | 88 | 8916 | 89 | 90 |  |  |  | 17 |
| 18 | 526 | 5256 | 524 | 5232 | 5220 |  | 51 | 5184 | 5172 | 17 | 4 | 1052 |  | 1154 | 1205 | 1256 |  | 1358 | 1409 | 1460 | 18 |
| 19 | 500 | 4993 | 49 | 4967 |  | 4942 | 49 | 4917 | 4904 | 18. | ， | 333 | 3387 | 3440 | 349 | 3548 | 3602 | 3656 | 3709 |  | 19 |
| 20 | 47 | 4729 | 4716 | 4702 |  |  | 4663 | 左 | 36 | 19. | 4.55 | 56 | 5670 | 5727 | 5783 | 584 | 589 | 5953 | 6010 | 6067 | 20 |
| 21 | 447 | 4466 | 4452 |  | 4424 |  |  | 4382 | 4368 | 20 435 |  |  |  |  |  |  |  |  |  |  | 21 |
| 22 | 421 | 420 | 418 | 4173 | 415 | 41 | 4129 | 4114 | 40 | 21.4 |  | 017 |  |  | 036 | 042 |  |  |  |  | 22 |
| 23 | 395 | 39 | 39 |  | 3893 | 38 | 3862 | 3847 | 383 | $22 \cdot 381$ | 5.23 | 24 | 2521 | 2586 | 265 | 27 |  | 2846 | 2911 | 2977 | 23 |
| 24 | 369 | 3675 | 365 |  | 3627 |  |  | 3579 | 3563 |  |  | 473 | 48 | 4872 | 494 | 5008 | 5076 | 5144 | 12 | 528 | 24 |
| 25 | 3428 | 3411 | 3395 | 3378 | 3361 | 3345 | 33 | 3311 | 3295 | 24．3 | 5.6946 | 7017 | 7088 | 7159 | 22 | 7300 | 737 | 7442 | 7512 | 583 | 25 |
| 26 | 316 | 3148 | 3131 | 3113 | 3096 | 3079 | 3061 | 3044 | 3027 | $25 \cdot 3009$ | 5.9224 | 9298 | 9371 | 94 | 9518 | 9592 | 9666 | 9739 | 3 | 9887 | 26 |
| 27 | 290 | 2884 | 2866 |  |  |  | 2794 |  |  | 26.274 | 6.15 |  |  | 1731 | 1808 | 188 |  |  | 3 |  | 27 |
| 28 | 263 | 26 | 26 | 2583 | 2565 |  | 2528 | 250 |  | $27 \cdot 247$ |  | 385 |  | 40 | 1097 | 41 | 42 | 43 | 4414 |  | 28 |
| 29 | 23 | 23 | 2338 |  |  |  | 226 | 224 | 2222 | 28.220 |  | 6140 | 6222 | 6304 | 638 | 646 | 65 | 66 | 6714 | 679 | 29 |
| 30 | 21 | 2094 |  |  | 2034 | 2014 | 1994 | 1974 | 1954 | 29.1934 | 8335 | 8420 | 8505 | 590 | 8675 | 876 | 8845 | 930 | 01 | 9100 | 30 |
| 31 | 185 | 1830 |  |  |  |  |  |  | 1685 | 30．166 | 061 |  |  |  |  | 1052 |  |  |  |  | 31 |
| 32 | 158 | 15 | 1545 | 152 | 150 |  |  | 1439 | 1417 | 31 |  |  |  |  | 3254 | 33 |  |  |  |  | 32 |
| 33 | 13 | 13 | 1281 |  | 1237 |  |  | 1171 |  | 32．112 | 516 |  |  | 54 | 55 | 56 |  |  | 5916 |  | 33 |
| 34 | 1062 | 1039 | 1017 |  |  |  |  | 0904 | 0881 |  | 742 |  |  | 7736 | 783 | 792 |  | 81 | 821 | 831 | 34 |
| 35 | 0799 | 0776 | 0753 | 072 |  | 0683 |  | 36 | 061 | 34.058 | 7.9725 | 9824 | 9923 | －022 | 研 | 0220 | 0319 | 04 | 051 | 061 | 35 |
| 36 | 0536 | 05 | 0488 | 0464 | 0441 | 0417 | 0393 | 0368 | 0344 | 35．0320 | $8^{\circ} 2002$ | 2104 | 2206 | 2308 | 2410 | 251 | 2614 | 2716 | 2818 | 292 | 36 |
| 37 |  |  |  |  |  | 0150 | 0126 | 0101 |  |  |  |  |  |  |  |  |  | 014 | 118 |  |  |
| 38 | 101 | 99 | 99 | 9935 | 9909 | 9884 | 9859 | 9833 | 9808 | $36 \cdot 9$ | ． 655 | 66 |  |  | 698 | 7096 | 7204 |  |  |  |  |
| 39 | 974 | 9722 | 96 |  |  |  |  |  |  |  | 88 |  |  |  | 927 | 93 | 94 | 9609 | 9719 |  |  |
| 40 | 948 | 9458 | 9432 |  | 9378 | 9352 | 9325 | 9298 | 9272 | 824 | 9．71 | 122 | 134 | 1454 | 156 | 168 | 179 | 1907 | 202 | 213 | 40 |
| 41 | 92 |  |  |  |  |  |  |  |  |  | 9.339 |  |  | 3740 |  |  |  |  |  |  |  |
| 42 | 895 |  |  |  |  |  |  |  |  | 40.87 |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 86 | 86 | 8639 | 8610 | 8582 | 8553 | 8524 | 8496 | 8467 | 41 ＇843 | $9 \cdot 79$ |  |  | 8313 | 84 |  |  |  | 8921 |  |  |
| 44 | 843 | 8404 | 837 | 8345 | 8316 | 8287 | 8258 | 822 | 81 |  | 10.02 |  |  | 059 | 072 | 08 | 0973 | 109 | 122 | 1346 | 44 |
| 45 | 817 | 8140 | 8111 |  |  | 8021 | 7991 | 7961 | 793 | 43 | 10.2 |  | 27 | 288 | 30 | 31 | 326 | 339 | 352 | 1365 |  |
| 46 | 7907 | 7877 | 7846 | 7816 | 7785 | 7754 | 7724 |  | 7662 | 44 | 10 |  |  |  |  | 5432 |  |  |  |  | 46 |
| 47 |  | 13 | 7582 | 7551 | 7520 |  | 7657 | 7426 | 7394 | 45736 | 10.70 |  |  | 7458 | 759 |  |  |  | 123 | 25 |  |
| 48 | 738 | 7350 | 73 |  |  |  |  |  | 71 | 46 | 10.9 |  |  |  | 988 |  | 0152 |  | 0424 |  |  |
| 49 | 71 | 7086 | 70 |  |  |  | 23 | 6890 | 6858 | $47 \cdot 68$ | 11.16 |  | 1892 | 2031 | 1 |  | d | 6 | 272 |  |  |
| 50 | 6856 | 6823 | 6789 | 6756 | 672 | 6690 | 6656 | 6623 | 65 | 48.6556 | 11 | 4034 | 4175 | 4317 | 445 |  | 4742 | 4883 | 5025 |  | 50 |
| $5 i$ | 659 | 6559 | 652 |  | 645 | 642 |  |  |  | 49.628 |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 63 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 6067 | 60 | 59 | 5962 |  | 5891 | 5856 | 5820 | 5785 | 51.574 | 12.07 |  | 1026 | 117 | 13 | 1476 | 1626 | 776 | 1926 |  |  |
| 54 | 5804 | 57 | 57 | 56 |  |  |  | 55 | 55 |  |  | 31 |  | 34 | 361 | 37 |  | 4074 | 42 | 438 |  |
| 55 |  |  |  | 54 |  |  | 5322 |  |  | 5212 | 12.5 |  |  |  |  |  | 6216 |  |  |  |  |
| 56 | 5278 |  | 5204 | 5167 |  |  |  |  |  | 54．4943 |  |  |  |  |  |  |  |  |  |  |  |
| 57 |  | 4978 | 4940 | 4902 |  |  | 4788 | 4750 | 4712 | 55.467 | 12.98 |  |  |  |  |  |  |  |  |  |  |
| 58 | 4753 | 4714 | 4676 | 463 |  | 45 | 4521 | 4483 | 444 | 5644 | 13. | 22 | 24 | 26 |  |  |  |  |  |  |  |
| 59 | 4490 | 4451 | 4412 | 43 |  |  | 4254 | 4215 |  | 413 | $13 \cdot 43$ |  | 4727 | 4894 | 50 |  |  | 562 | 5729 |  |  |
| 60 | 42 | 4187 | 4147 | 4107 | 406 | 4028 | 3988 | 3947 | 3907 | 58.3867 | 13.6671 | 6841 | 7011 | 7180 | 735 | 7520 | 7690 | 860 | 8030 | 20 | 60 |
| 61 | 396 |  | 3883 |  |  |  | 3721 |  |  |  | $13 \cdot 89$ |  |  |  |  |  |  |  |  |  |  |
| 62 | 370 |  |  |  |  |  |  |  |  | 1 | $14 \cdot 12$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 3103 | －30 |  |  |  | 40 | 4218 |  |  | 4753 |  |  |  |
| 64 | 3175 | 3133 | 3090 | 30 | 30 | 296 | 2920 | 287 | 283 | 62. | 14 | 59 | 614 | 63 | 65 | 66 |  | 70 | 7232 |  |  |
| 65 | 29 | 2869 | 2826 | 2783 |  | 2697 | 653 | 2610 |  | 63．2523 | 14.80 |  | 342 |  | 87 | 8980 |  | 3348 | 9532 |  |  |
| 66 | 2650 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 318 |  |  |  |  | 413 |  |  |
| 68 | 212 | 20 | 2034 | 198 | 1943 | 1898 | 185 | 180 | 176 | $66 \cdot 17$ | 15.48 | 508 |  | 54 |  |  |  |  | 寿 |  |  |
| 69 |  |  |  |  |  |  | 1586 |  |  |  |  |  |  | 㾝 | 795 |  |  |  | 8734 |  |  |
| 70 |  | 1552 |  | 145 | 141 | 1366 | 1319 | 1272 | 1225 | $68 \cdot 117$ | 5.94 | 964 | 984 | ＋04 | 024 | 044 | 0638 | 83 | 1035 | 123 | 70 |
| 71 |  | 1288 | 124 |  |  |  | 1052 |  |  |  | 16.17 | 19 |  | 233 | 25 |  | 2933 |  |  |  |  |
| 72 | 107 | 1025 | 997 |  |  |  | 0785 | 073 | 068 | 70．06 | 16.40 | 42 |  | 461 | 482 |  |  |  |  |  |  |
| 73 | － |  |  |  | 06 | 05 | 0518 |  |  | 71.037 | $16 \cdot 6$ |  | 6 | 690 | 7110 |  |  | 73 |  |  |  |
| 74 | 054 | 0498 | 0448 | 03 | 035 | 03 | 0251 | 0202 | 01 | 72.0103 | 16.85 | 877 | 8980 | 918 | 939 |  | 9818 | ＋027 | 0237 | 04 |  |
| 75 | 0284 | 0234 | 0184 |  |  |  |  |  |  | 834 | 17.0838 | 105 | 1263 | 1476 |  |  |  |  |  |  |  |
| 76 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 77 | 9758 | 9707 | 96 | 9605 | 955 | 9502 | 9451 | 939 | 934 | 74.929 | 17.53 | 56 | 58 | 60 | 626 | 64 | 6702 | 6920 | 713 | 73 |  |
| 78 | 94 | 94 | 93 | 9340 | 92 | 9236 | 9184 | 9132 | 9080 | 75.902 | $17 \cdot 76$ | 7893 | 81 | 833 | 85 | 877 | 8997 | 921 | 943 | 966 |  |
| 78 |  |  | 1023 |  |  | 寿 | ， | 8854 | 8 1 | 76.8758 | 17.9950 | 17 | 239 | O62 | 884 | 1068 | 128 | 1518 | 倍 |  |  |
| 80 | 8969 | 8916 | 8863 | 8810 | 8757 | 8703 | 650 | 8597 | 8543 | 77：8490 | 18.222 | 245 | 268 | 290 | 313 | 336 | 358 | 3813 | 404 | 42 | 80 |
| 81 | 8706 | 86 | 8599 | 8545 | 849 | 8437 | 383 | 832 | 827 | 78.822 | 18.45 | 473 | 4964 | 519 | 54 | 56 | 5882 | 6111 | 6340 |  |  |
| 82 | 8444 | 研 | 8335 | 2280 | 822 | 817 | 8116 | 806 | 8007 | 79＇795 | 18.67 |  | 7248 | 748 | 7712 | 923 | 8176 | 8409 | 864 |  |  |
| 8 | 8181 | 812 | 8070 | 8015 |  |  |  | 7794 |  | O |  | 929 | 9531 | 976 | ＋001 | 023 | 04 | 0706 | 094 | 11 |  |
| 84 | 7918 | 7862 | 7806 | 7750 | 7695 | 39 | 7583 | 7526 | 7470 | 81.741 | 19.133 | 15 | 1815 | 205 | 229 | 25 | 2766 | 3004 | 324 | 34 |  |
| 85 | 765 |  |  |  |  | 保 |  |  |  | 8 | 析 | 885 |  | 4339 | 4580 | 4820 |  | 5302 |  |  |  |
| 6 | 7392 | 7335 | 7278 |  |  |  |  |  |  |  |  |  |  | 62 |  | 711 | 7356 |  | ， |  |  |
| 87 | 7129 | 707 | 7014 | 6956 | 689 | 6840 | 6782 | 6724 | 666 | $84 \cdot 660$ | 19.817 | 8419 | 8665 | 8912 | 9158 | 940 | 965 | 989 | －1 |  |  |
| 88 | 806 | 6808 | 674 | 6 |  | 574 | 5 | 4， | 6397 | 85.633 | 245 | 070 | 094 | 1198 | 144 | 169 | 1945 | 2195 | 44 |  |  |
| 89 | 66 | 654 | 6485 | 6426 | 6367 | 6308 | 6248 | 6189 | 6129 | 86.6070 | 20 | 2980 | 3232 | 3484 | 3736 | 398 | 4240 | 4492 | 474 | 499 |  |
| 90 | 6340 | 6281 | 6221 | 616 | 6101 | 6041 | 59 | 592 | 586 | 87.5801 | $20 \cdot 5006$ | 526 | 55 | 577 | 60 | 628 | 653 | 679 | 704 | 730 |  |
| 91 | 6078 | 601 | 5957 | 589 |  | 5775 | 5714 | 5654 | 55 | 8.553 | $20^{\prime} 72$ | 7542 |  | 8057 | 83 | 85 | 8830 | 9088 | 9345 |  |  |
| 92 | 5815 | 575 | 569 | 563 | 5370 | 5509 |  | 5386 | 5325 | 5 |  | 82 |  | 0343 | 660 | 886 |  |  | 位 |  |  |
|  | 555 | 549 | 542 | 536 | 5305 | 5243 | 5181 | 5119 | 5056 | $90 \cdot 499$ | $21 \cdot 183$ | 2103 | 2366 | 263 | 289 | 315 | 3420 | 3683 | 394 | 42 | 93 |
| 94 | 289 | 5227 | 5164 | 5102 | 239 | 4977 | 4914 | 4851 | 4788 | 472 |  | 4384 | 4650 | 491 | 518 | 5448 | 5714 | 598 | 624 | 6si |  |
|  | 5026 | 4963 | 490 | 4837 | 4774 | 4710 | 左 | 4584 |  | 92.445 |  |  |  | 7202 |  | 77 | 80 | 8278 | 84 | 881 | 95 |
| 96 | 4763 | 4699 | 4636 | 4572 | 4508 | 4444 | 4380 | 4316 | 4252 | $93 \cdot 4187$ | 218673 | 8945 | 9217 | 948 | 976 | －032 | 0304 | 0576 | 0848 | 11 | 96 |
| 97 | 4500 | 4436 | 4372 | 4307 | 4243 | 4178 | 4113 | 4048 | 3984 | 94．391 | $22 \cdot 09$ | 122 | 1500 | 177 | 20 | 2324 | 2599 | 2874 | 3148 | 342 |  |
| 98 | 4237 | 4 | 4107 | 4042 | 3977 | 361 | 3846 | 析 | 3715 | 953650 | 22.322 | 5788 | 378 | 406 |  | 46 | 4894 | 514 | 5449 | 5726 |  |
|  | 3974 | 390 | 3843 | 3777 | 3711 | 3646 | 3579 | 3513 | 3447 | 96.3381 | 22.550 | 578 | 606 | 6348 | 6628 | 69 | 7189 | 7469 | 74 | 302 | 99 |
| 100 | 3712 | 3645 | 3579 | 3512 | 3446 | 3379 | 3313 | 3246 | 3179 | 973112 | 22.7784 | 8068 | 8351 | 8634 | 8917 | 9200 | 9484 | 9767 | 050 | 333 | 10 |
|  | 50＇ | $149^{\prime}$ | $48^{\prime}$ | 47 | 46 | 45＇ | $44^{\prime}$ | $43^{\prime}$ | 42＇ | 41 |  |  |  | 47 ${ }^{\prime}$ | ｜ $46^{\prime}$｜ | $145^{\prime}$ |  |  |  |  |  |
| 76 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 13 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $13^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\circ}$ |  |  | $23^{\prime}$ | ， | $25^{\prime}$ |  |  |  |  |  |  |  |  | $24^{\prime}$ | ${ }^{25^{\prime}}$ |  |  |  |  |  |
|  | 9730 | 9730 | 9729 | 9728 | 97 | 72 | 9726 | 972 | 9725 | ． 972 | 230 | 2309 | 2312 | 2315 | 2317 | 20 | 2323 | 2326 | 2329 |  |  |
|  | 9461 | 9460 | 94 | 9457 | 9456 | 9454 | 9453 | 9451 | 9450 | $1 \cdot$ | 461 | 4618 | 4624 | 4629 |  | 641 |  | 4652 |  |  |  |
|  | 9191 |  |  |  |  |  |  |  |  |  |  |  |  | 6944 |  |  |  |  |  |  |  |
|  |  | 8919 |  |  | 89 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 8652 |  |  |  | 8639 |  |  |  |  | 48 | 153 | 154 |  | 1573 | 587 | 1602 |  |  | 1644 |  |  |
|  | 8383 | 8379 | 8375 | 8371 |  | 8363 |  | 8354 |  | 5.8346 | ＇3837 | 3854 | 3871 | 388 |  |  |  |  |  |  |  |
|  | 8113 | 8108 | 8104 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8517 |  |  | 858 | 860 |  |  |  |
|  | 7574 | 7568 |  |  |  |  |  |  |  |  |  |  |  | 0832 | 085 | 0883 | 09 |  |  |  |  |
| 1 |  |  |  |  |  |  |  |  |  | 9.724 | $2 \cdot 3062$ |  | 3118 |  | 3175 | 3203 | 3231 |  |  |  |  |
| 11 | 7035 | 7028 |  |  |  |  |  | 6983 | 6976 | 10.6 | 2.5368 | 5399 | 543 | 546 | 549 | 5523 | 5555 |  |  |  |  |
| 12 |  | 6757 |  |  | 6733 |  | 67 |  | 6701 |  |  | 7708 | 774 | 7776 | 7810 | 7844 | 7878 |  |  |  | 12 |
| 13 | 6496 | 6487 | 6478 | 6470 | 6461 | 64 | 64 | 6435 | 6426 | 12.641 | 教 | ＋013 | 00 | 00 | 0127 | 01 | 0201 | 38 |  |  | 13 |
| 14 | 6226 | 6217 | 6207 | 6198 | 61 |  | 6170 |  | 615 |  | 322 | 23 | 236 | 2405 | 2445 | 2484 | 2524 |  |  |  | 14 |
| 15 | 5957 | 5947 | 5937 | 5926 | 5916 | 5906 | 5896 | 5886 | 5876 | 14.5 | $3 \cdot 45$ | 46 | 467 | 4720 | 476 | 48 | 484 | 4890 |  |  | 5 |
| 16 | 5687 | 56 | 5066 | 5655 |  | 56 |  |  | 5601 | $15 \cdot 55$ | 3.6899 |  |  | 7034 |  |  |  |  |  |  | 16 |
| 17 |  | 5406 | 53 |  | 53 |  |  |  | 5326 | 16．531 |  |  |  |  |  |  |  |  |  |  |  |
| 18 |  | 5136 | 5124 |  | 5100 |  |  |  |  |  |  |  | 16 |  | 171 |  | 18 |  |  |  | 8 |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4247 |  | 9 |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8726 | 8786 |  |  |  | 21 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 104 |  |  | 1234 |  | 22 |
| 23 | 380 | 3 |  | 372 |  |  |  |  | 36 | $22^{3} 36$ |  |  |  |  |  |  |  |  |  |  | 23 |
| 24 | 353 | 35 | 349 | 34 |  | 3450 |  |  | 340 |  | 5.53 | 5416 |  |  |  |  |  |  |  |  | 24 |
| 25 | 326 | 3244 | 3228 | 3211 | 3194 | 3177 | 316 | 3143 | 3126 | 2431 | 5.76 | 7725 | 77 | 7866 |  | 8008 | 807 | 8149 |  |  | 25 |
| 26 | 29 | 2974 | 2957 | 2939 | 2922 | 29 | 2 |  |  | 25 | 5.996 | －0 |  | 01 |  | 10328 |  |  |  |  | 26 |
| 27 | 272 | 2704 | 268 |  |  | 263 | 26 |  |  | 26 | 62 |  |  |  |  |  |  |  |  |  |  |
| 28 |  | 24 | 2415 |  |  |  |  |  |  |  | 6．457 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 | 19 | 1893 | 1873 | 185 | 1833 | 1813 |  |  |  | 29.17 |  |  |  |  |  |  |  |  |  |  | 30 |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 11 | 108 | 10 |  | 1016 |  |  |  |  |  |  |  |  | 6383 | 6477 | 6570 |  |  |  |  |  |
| 34 |  | 08 | 07 | 07 |  |  |  |  |  |  |  |  |  |  |  | 8891 |  |  |  |  | 34 |
| 35 | 0566 | 05 | 05 | 0495 | 0472 | 0448 | 042 | 040 | 0377 | 34 | 8.071 | 0815 | 0914 | 1013 | 1112 | 121 | 13 | 1409 | 1508 |  | 35 |
| 36 | 02 | 0272 | 02 | 0224 |  |  | 01 | 01 |  |  | 8.302 |  |  |  |  |  |  |  |  |  |  |
| 37 |  | －002 |  |  |  |  |  |  |  | 35＇98 | $8 \cdot 53$ |  |  |  |  |  |  |  |  |  |  |
| 38 |  | 973 | 97 |  |  |  | 960 |  | 95 | 36．95 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 921 | 919 |  | 9137 | 9110 |  |  |  |  |  |  |  | 247 | 258 |  |  |  |  |  |  | 40 |
| 41 |  |  |  | 88 | 88 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 85 |  |  |  |  | 8452 |  |  |  |  |  |  |  |  |  |  |  |  |
| 43 |  | 83 | 83 |  |  |  |  |  | 817 | 41 |  |  |  |  | 965 | 977 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 |  | 7840 | 7810 |  | 7749 |  |  |  | 7628 | 43.7597 | $10 \cdot 377$ | 3905 | 40 | 4159 | 4287 | 4414 | 4541 |  |  |  | 45 |
| 46 | 7601 | 7570 | 7539 | 7508 |  | 7446 | 7415 | 7384 | ${ }^{7353}$ | 44 | $\frac{10.60}{}$ | 62 |  |  |  |  |  |  |  |  | 46 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 | 70 | 702 | 69 |  | 69 | 6900 |  | 6835 | 688 |  | 11.0 |  |  |  |  |  | 位 |  |  |  | 48 |
|  |  | 575 |  |  |  |  |  |  | 65 |  |  |  |  |  |  |  |  |  |  |  | 49 |
| 50 | 652 |  |  |  |  |  |  | 628 | 6253 | $48 \cdot 6219$ | 11.53 |  | 559 |  |  |  | 615 |  |  |  | 50 |
| 51 |  | 6219 | 61 | 6150 | 61 |  |  |  |  |  | 11.76 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 57 | 56 | 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 |  | 5138 |  |  |  |  | 495 | 4915 | 4878 | 53．4841 | 12.683 |  |  | 7305 |  |  |  |  |  |  | 5 |
| 56 | 490 | 48 | 4830 | 4792 |  | 4717 |  | 4641 | 4603 |  |  | 9303 | 94 | 9620 | 977 | 993 | 10 |  |  |  |  |
| 57. |  | 459 | 45 | 45 | 44 |  |  | 436 | 43 |  |  |  | 17 |  |  |  |  |  |  |  |  |
| 58 | 4366 | 432 | 428 | 42 | 42 | 417 |  |  | 378 |  | 析 |  | 408 | 4250 | 6731 | 4578 | 4742 |  |  |  | 58 |
|  |  | 403 |  | 3977 | 3938 | 3898 | 3858 | 3818 | 358 |  | $13 \cdot 60$ |  | 639 | ¢ | 673 | 6898 |  |  |  |  | 59 |
| 60 | 38 | 3787 | 3746 | 3708 | 3666 | 362 | 358 | 3544 | 3503 | 58．346 | 13：837 | 85 | 870 | 887 | 904 |  | 938 |  | 9728 |  | 60 |
| 61 | 3557 | 3516 | 347 | 343 | 3393 | 335 |  |  | 322 | 91 | 14.06 | ， | 102 |  |  |  |  |  |  |  |  |
| 62 |  | $324$ | 3205 | 31 | 31 |  |  | 299 | 295 | 60.22 | 14：2982 | 31 | 333 | 3508 | 368 | 3859 | 403 | 4210 |  |  |  |
| $63$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 635 |  |  |  |  |
| 64 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 65 | 247 | 2436 |  |  |  |  |  |  |  | 63：2085 |  |  |  |  |  |  |  |  |  |  | 65 |
| 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 |  | 16 | 15 |  | 14 |  | 1396 |  | 13 | ． | 15.68 |  | 7204 |  |  |  | 7973 | 816 |  |  |  |
| 69 |  | 13 |  |  |  |  |  | 1076 |  | 67．0982 | 15.912 | 93 |  | 倍 |  | 110 | 23 |  |  |  |  |
| 70 | 1131 | 1084 | 1037 |  |  | O | 08 | 0801 | 0754 | 68.070 | $16 \cdot 1431$ | 1629 | 1827 | 2025 | 222 | 242 | 262 | 281 | 30 |  | 70 |
| 71 | 0862 | 0814 | 0766 |  | 0671 | 06 | 0575 |  |  |  |  |  |  |  |  | 474 | 494 |  |  |  |  |
| 72 | 059 | 05 | 04 | 04 | 0399 | 0350 | 030 | 293 |  |  | 16. |  | 64 |  | 685 | 706 |  |  |  |  |  |
| 7 | 03 | 027 | 0225 |  |  |  |  | 9979 |  |  |  |  |  |  |  | 938 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 75 | 9784 | 9733 |  |  |  |  | 948 | 9430 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 951 |  |  |  |  | 92 |  |  | 910 | $73 \cdot 9$ | 17.52 |  |  |  |  | 634 | 65 |  |  |  |  |
|  | 92 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 79 |  |  |  |  |  |  |  |  |  |  |  | 2410 | 2634 | 253 | 研 |  | 352 |  |  |  |  |
| 80 | 843 |  |  | 221 | 822 | 816 | 8113 |  | 8004 | 77795 | 18．449 | 471 | 494 | 517 | 539 | 562 |  | 607 | 6304 |  |  |
|  | 816 | 8112 |  |  |  | 7894 | 7839 | 7784 | 7730 |  | 18.67 |  | 7257 | 1487 | 771 |  | 8174 | 840 |  |  |  |
|  | 7897 | 78 | 778 | 7731 | 7676 | 762 |  | 7510 | 7455 | $79 \cdot 73$ | 18.91 | 9337 | 956 |  | ${ }^{03}$ | 265 |  |  |  |  |  |
|  | 7627 | 757 | 75 | 746 | 740 | 73 | 729 | 7236 |  | 80.71 | 19.141 |  | 188 | 2116 |  |  |  |  |  |  |  |
|  | 735 | 731 |  |  |  |  |  |  |  | 81.6 | 19.371 |  | 419 | 443 |  |  |  | 5381 |  |  | 34 |
|  |  | 70 |  |  |  |  |  |  |  |  | 19.60 |  | 650 |  |  |  |  |  |  |  |  |
| 86 | 681 | 67 | 67 | 66 |  |  |  |  |  |  | 1983 |  | 8816 | 96 |  | 954 |  |  |  |  |  |
|  | 654 | 649 | 6432 |  | 63 | 6256 |  | 61 |  |  | 20 | 0882 | 112 | 137 | 162 | 186 | 211 |  |  |  |  |
| 8 |  |  |  |  |  |  | 59 |  |  |  |  |  | 34 |  |  |  | 6475 |  |  |  |  |
|  |  |  |  |  |  | 5710 | 53 |  |  |  |  |  |  |  |  |  |  | 933 |  |  | 89 |
|  | 547 | 54 |  |  | 5226 |  | 5103 | 5042 |  |  |  |  |  |  |  |  |  |  | 192 |  |  |
|  | 521 | 513 | 5078 | 5016 | 4954 |  |  | 4 | 4705 | 89 |  | 2427 | 26 |  | 32 |  |  |  | 424 |  |  |
|  | 493 | 4869 | 4807 | 47 | 4682 | 4619 | 4556 | 4493 | 4430 | 90．43 | 21．4473 | 4736 |  | 526 | 552 |  |  | 631 |  |  |  |
|  | 46 | 4 | 453 | 4473 | 44 | 43 | 42 | 4219 | 415 | 91.40 | 21.6779 | 7045 | 731 | 757 | 784 | 810 |  |  |  |  |  |
|  | 439 | 432 | 426 | 420 | 413 | 407 | 40 | 3945 | 388 | 92.381 | 21.9085 | 9354 | 962 | 989 | ．16 | 042 | 0698 | 096 | 1236 |  |  |
|  | 412 | 405 | 析 | 3929 | 3 | 3802 | 3735 | 3670 | 360 | 3 | $22 \cdot 139$ |  | 1935 | 2206 | 24 | 275 |  |  | 5364 |  |  |
|  |  | 378 |  |  |  |  | 3462 3188 |  | 33 | 9432 |  |  |  | 45 | 479 |  | ${ }_{7668}^{534}$ |  |  |  |  |
|  | 3314 | 329 | 291 |  |  |  |  |  |  |  |  |  |  |  | 9430 | 9711 |  | 259 |  |  |  |
|  | 3045 | 2978 | 291 | 2843 | 2776 | 2708 | 2641 | 2573 | 2506 | $7{ }^{\text {a }}$ | 3．061 | 899 | 182 | 146 | 1748 | 2031 | 2314 | 2597 |  |  |  |
|  |  | 39 |  | $3{ }^{1}$ | $36^{\prime}$ | ｜ $35^{\prime}$ | $34^{\prime}$ | $33^{\prime}$ | $32^{\prime}$ | $31^{1}$ | $40^{\prime}$ |  | 38 | 37 | 36 | 35 | 34 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $13^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $13^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | $34^{\prime}$ | 35＇ | 36 | $37^{\prime}$ | 38＇ | $39^{\prime}$ | $30^{\prime}$ | $31^{\prime}$ | 32 | 33＇ | 34 | $35^{\prime}$ | 36 | 37 | $38^{\prime}$ |  |  |
|  | 97 | 972 | 972 | 97 | 97 | 9720 | 972 |  | 9718 | 971 | 233 | 2337 | 2340 | 2343 | 23 | 23 | 2351 | 2354 | 235 |  |  |
|  | 94 | 9446 | 94 | 9443 | 9442 | 94 | 9439 | 9438 | 94 | 435 | 236 | 4675 | 468 | 468 | 4692 | 4697 | 4703 | 4708 | 4714 | 4720 |  |
|  | 917 | 9169 | 9167 | 916 | ， | 91 | 915 | 9157 | 9155 |  | 003 | 7012 | 702 | 7029 | 7037 | 7046 | 7054 | 7063 | 07 | 7080 |  |
|  | 8895 | 8892 | 8889 | 8887 |  |  | 8878 | 8876 | 8873 | 3.88 | 338 | 93 | 9360 | 937 | 9383 | 932 | 9406 | 9417 | 9428 | 9440 |  |
| 5 | 86 |  |  |  |  |  |  |  | 8591 |  |  | 686 | 1701 | 1715 |  | 1743 | 75 | 1771 | 785 | 1800 |  |
| 6 | 834 | 8338 | 8334 | 8330 | 8326 | 8322 | 8318 | 8314 | 8309 | 5.8305 | － 4007 | 4024 | 4041 | 4058 | 4075 | 4092 | 4109 | 4125 | 4142 | 4159 |  |
|  | 806 | 806 | 8056 | 8052 | 8047 | 804 | 803 | 803 |  |  |  | 636 | 63 | 6401 | 6420 | 64 | 6460 | 80 | 6500 | 6519 |  |
|  | 7790 | 778 |  |  |  | 7762 |  |  |  | $7 \cdot 77$ | ． | 86 | 8721 | 874 |  |  | 8811 | 34 | 8857 | 8879 |  |
|  | 7513 | 750 |  |  |  |  |  |  | 7464 |  | ， | 1036 | 106 | 108 | 1112 | 析 | 163 | 1188 | 21 | 1239 |  |
| 10 | 7237 | 7230 | 7223 | 7217 | 10 | 7203 | 7196 | 7189 | 7182 | 9.7176 | ． 3345 | 3373 | 3401 | 3429 | 34 | 348 | 3514 | 3542 | 357 | 559 |  |
| 11 | 6961 | 6953 | 694 | 69 | 6931 | 69 | 691 | 6908 | 6901 | $10^{\circ}$ | 2.5679 | 57 | 57 | 5772 | 5803 | 58 | 5866 | 5897 | 5928 | 959 |  |
| 12 | 668 | 667 |  |  | 6652 |  | 6635 | 6627 | 6 |  | 8013 | 8047 | 8081 | 8115 |  | 8183 | 82 | 8251 | 8285 | 319 |  |
| 13 | 6408 | 639 | 63 | 6382 | 6373 | 636 | 63 | 63 | 633 | 12. | ．0348 | 03 | 0421 | 045 | 04 | 05 | 0568 | 060 | 0642 | 0679 | 3 |
| 14 | 6132 | 6122 |  |  | 6094 | 6084 |  | 6065 | 6355 | $13 \cdot 60$ | 2682 | 2722 | 2762 | 280 | 28 | 28 | 2920 | 2959 | 2999 | 303 |  |
| 15 | 5855 |  |  |  |  |  |  |  |  |  |  |  | 02 | 514 | 5186 |  | 5271 |  | 5356 |  | 15 |
| 16 | 557 | 55 | 5557 | 5547 | 5536 | 5525 | 5514 | 5503 | 5492 | 15.5481 | $3 \cdot 7351$ | 7397 | 7442 | 7487 | 7532 | 757 | 7623 | 7668 | 7713 | 7758 | 16 |
| 17 | 530 | 52 |  |  | 5257 | 52 | 5233 | 52 | 52 |  |  | 97 | 97 | 983 |  | 9926 | 9974 | ＋022 |  | 0118 |  |
| 18 | 502 | 50 |  | 4990 | 4978 | 49 | 4953 |  | 492 | 17.49 | ． 2020 | 20 | 2122 | 217 | 2224 | 2275 | 23 | 2376 | 2427 | 2478 | 18 |
| 19 | 475 | 473 | 47 | 4712 | 4699 | 46 | 46 | 46 | 46 | 18.46 | $4 \cdot 4355$ | 44 | 44 | 45 | 4570 | 4623 | 4677 | 47 | 478 | 4 | 19 |
| 20 | 4474 | 4460 | 47 | 4433 | 4420 | 4 | 4392 | 4379 | 4365 | 19.435 | 4.6689 | 67 | 680 | 685 | 69 | 69 | 7028 | 708 | 71 | 7198 | 20 |
| 21 | 41 | 41 |  |  |  |  |  |  |  | 20.40 |  |  |  |  |  |  |  |  |  |  |  |
| 22 | 39 |  |  |  |  |  |  |  |  |  |  |  | 14 |  |  |  |  |  |  |  |  |
| 23 | 36 | 36 | 36 | 3598 | 3582 | 356 |  |  | 3520 | 22 | 5682 | 37 | 38 | 38 | 39 | 40 | 40 | 4148 | 421 | 427 | 23 |
| 24 | 336 |  |  |  |  | 328 |  |  |  | $23 \cdot 32$ |  | 6095 | 61 | 62 | 62 |  | 64 | 6502 | 657 | 66 |  |
| 25 | 309 | 307 | 3058 | 41 | 24 | 3007 | 2990 | 2973 | 2956 | 24.293 | ．8361 | 8432 | 8503 | 857 | 86 | 871 | 8786 | 8856 | 8927 | 899 | 25 |
| 26 | 28 | 27 | 2781 | 2763 | 2745 | 2728 | 2710 | 2692 | 2674 | 25 | 6.0696 | 0769 | 0843 | 0916 | 0990 | 1063 | 1137 | 1210 | 1284 | 135 | 26 |
| 27 | 25 | 25 |  |  |  | 2448 |  |  |  |  |  |  | 318 | 325 |  |  | 3488 | 3565 |  | 37 | 27 |
| 28 | 22 | 22 | 2225 | 2206 | 2187 | 216 |  |  |  | 27 |  | 5444 | 5 |  |  |  |  | 5919 |  |  | 28 |
| 29 | 19 |  | 1948 | 1928 | 1908 |  |  |  |  |  | ． 76 | 7781 | 786 | 794 | 802 | 8109 | 8191 | 8273 | 8355 | 843 |  |
| 30 | 1711 | 169 | 1670 | 1650 | 1629 | 1609 | 1588 | 1568 | 1547 | $29 \cdot 15$ | 7.0034 | 0118 | 020 | 028 | 03 | 0458 | 05 | 062 | 07 | 0797 | 30 |
| 31 | 143 |  |  |  | 1350 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 115 | 113 | 111 | 109 | 107 | 10 | 10 | 10 | 098 |  | 4 |  | 488 |  |  |  |  | 53 |  |  | 32 |
| 33 | 08 | 08 | 083 | 0815 | 0792 | 07 |  | 07 |  | 32.06 | 703 | 7130 | 7224 | 731 | 7410 | 75 |  | 76 | 77 | 787 | 33 |
| 34 | 060 | 05 | 0560 |  |  |  |  |  |  | 33．039 |  | 9468 | 956 | 96 |  | 98 | 9948 | 104 | 01 | 023 |  |
| 35 | 032 | 03 | 0 | 0258 | 0234 | 0210 | 018 | 0162 | 0138 | 34．01 | ． 1706 | 1805 | 190 | 200 | 21 | 22 | 2300 | 239 | 249 | 259 | 35 |
| 36 | 00 | 0029 | 1004 | 9980 | 9955 | 9931 | 9906 | 9881 | 985 | 34．9832 | ． 4040 | 4142 | 4244 | 4346 | 4448 | 4549 | 4651 | 4753 | 4855 |  | 36 |
| 37 | 97 |  | 9727 |  | 9676 | 9651 |  |  |  |  |  |  | 6584 |  |  |  |  |  |  |  |  |
| 38 | 950 | 94 | 9449 | 23 | 93 | 9371 | 934 | 931 | 929 |  |  | 88 | 89 |  | 91 |  |  | 9461 | 硡 |  |  |
| 39 | 92 | 9198 | 9171 | 9145 | 9118 | 90 |  | 90 | 9011 |  |  | 1154 | 1264 | 137 | 14 |  | 17 | 1816 | 192 |  | 39 |
| 40 | 8948 | 8921 | 8894 | 8866 | 8839 | 8812 | 8784 | 8757 | 8730 | $38 \cdot 8702$ | 9.3378 | 3491 | 3604 | 3718 | 3831 | 394 | 405 | 417 | 4283 | 439 | 40 |
| 41 | 867 | 86 | 861 | 888 |  |  |  |  |  |  | 9.5713 | 5829 |  | 606 | 6176 |  |  |  |  |  |  |
| 42 | 839 |  |  | 8310 |  |  |  |  |  |  | ， |  |  | 8403 |  |  | 8760 |  |  |  | 42 |
| 43 | 8119 | 80 | 80 | 8031 | 8002 | 7973 | 79 | 791 |  | 4178 | 10.03 |  | 06 | 074 | 08 |  | 111 | 1233 | 135 |  | 43 |
| 4 | 784 | 78 | 7783 | 7753 | 7723 |  |  |  |  | 42 | $10 \cdot 2$ | 284 | 29 | 308 | 32 | 33 | 346 | 558 |  |  | 44 |
| 45 | 756 | 75 | 75 | 7475 |  | 7413 | 7382 | 7352 |  | 43.728 | 10.50 |  |  | 543 |  |  | 581 |  |  |  | 45 |
| 46 | 7290 | 7259 | 7228 | 7196 |  | 7134 | 7102 | 7071 |  | $44^{\circ}$ | 10 |  |  | 777 |  |  | 8165 |  |  |  |  |
| 47 | 701 |  | 6950 | 6918 |  |  |  | 6790 |  | 45－672 | 10.9719 | 9852 |  | 1118 |  |  |  | 0650 | 0783 |  |  |
| 48 | 6738 | 670 | 667 | 6640 |  | 65 |  | 65 | 64 | 46 | 11.205 | 21 | 23 |  |  | 27 | 28 | 3004 | 31 |  | 48 |
| 49 |  |  |  |  |  |  |  |  | 6194 |  | 11.43 | 45 | 466 | 48 |  |  | 52 | 535 | 549 |  |  |
| 50 | 61 | 615 | 6117 | 6083 | 6049 | 6015 | 598 | 5946 | 59 | 48.5878 | 11 | 6864 | 7006 | 714 | 7288 | 7430 | 7571 | 7712 | 7854 | 799 | 50 |
| 51 | 59 | 58 |  |  |  |  |  | 566 | 56 | 49.559 | 11.905 |  |  |  |  |  |  |  |  |  |  |
| 52 | 56 | 55 |  |  |  |  | 5420 |  |  |  |  |  |  |  |  |  |  | 242 |  |  |  |
| 53 | 535 | 53 | 5284 | 248 | 12 |  |  | 510 |  | 51．503 | $12 \cdot 37$ |  | 402 | 4176 |  | 4475 | 4625 | 477 | 492 |  |  |
| 54 | 508 | 504 |  | 49 |  |  |  | 48 | 47 | 52.474 | 12 | 62 | 63 | 65 | 66 | 6824 | 69 | 712 | 728 |  |  |
| 55 | 4803 | 476 | 4729 | 691 | 4654 | 46 | 45 | 454 | 4503 | 53．4465 | 12.83 | 855 | 870 | 886 | 9017 | 9173 | 9328 | 48 |  |  | 55 |
| 56 | 4527 | 44 | 4451 | 4413 |  |  |  |  |  | 54.418 |  |  |  |  |  |  | 1680 |  |  |  | 56 |
| 57 | 42 | 42 | 417 | 4135 | 40 | 4057 |  |  | 3940 | 55.39 |  |  |  |  |  |  |  | 4192 | 43 |  |  |
| 58 | 397 |  | 38 | 38 |  |  |  |  | 365 | $56 \cdot 36$ | $13 \cdot 5$ |  |  |  |  |  |  |  | 67 |  |  |
| 59 | 369 | 3658 | 3618 | 3578 | 3538 |  |  |  | 337 | 57.33 |  |  | 80 | 82 |  | 8567 | 8734 | 901 |  |  |  |
| 60 | 3422 | 338 | 33 | 329 | 3259 | 3218 | 3177 | 313 | 309 | 58.3053 | 14.006 | 023 | 04 | 057 | 0746 | 091 | 108 | 125 | 1425 |  | 60 |
| 61 | 314 | 31 |  | 3021 |  |  |  | 285 | 281 | 59.27 | 14.2402 | 2574 |  |  |  | 32 |  |  |  |  |  |
| 62 | 28 |  |  | 4 | 2701 |  |  |  |  |  | 14 |  |  |  |  |  |  |  |  |  |  |
| 63 | 259 | 25 | 2507 | 64 | 2421 | 237 | 233 |  | 224 | $61 \cdot 2$ | 14 |  |  |  |  |  |  |  |  |  |  |
| 64 | 23 | 22 | 22 |  |  | 2099 |  |  |  |  | 14.94 | 95 |  |  | ＋1 |  |  | 067 |  |  |  |
| 65 | 20 |  |  |  |  |  |  |  |  |  | 15•1740 | 析 | 2107 |  |  |  | 84 |  |  |  | 65 |
| 66 | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 148 | 14 | 1397 | 135 | 13 | 126 | 1214 | 1168 | 1122 | $65 \cdot 10$ | 15.6 | 65 | 67 |  | \％ | 73 |  |  | 792 |  |  |
| 68 | 121 |  | 1 | 1073 | 026 |  |  |  |  | 66.07 | $15 \cdot 8$ |  | 912 | 320 | 951 |  | 2088 | ＋38 | O2 |  |  |
| 6 | 093 |  | 41 | 0794 | 074 | 070 | 0653 | 060 | 0559 |  |  |  |  | 析 |  |  | 228 | 24 | 2 |  | 69 |
| 70 | 06 | 0611 | 0564 | 0516 | 0468 | 0421 | 0373 | 0325 | 0277 | 68.02 | 16．341 | 361 |  | 4006 | 42 | 4402 | 459 | 479 | 4995 | 519 | 70 |
| 71 | 03 |  | 0286 | 10238 | 0189 |  |  |  |  | 68.99 | $16 \cdot 57$ | 5947 |  |  |  |  |  |  |  |  |  |
| 72 |  |  |  |  |  |  |  |  |  |  | 16.8081 | 8284 |  |  |  |  | 930 | 950 |  |  |  |
| 73 | 983 | 97 | 31 | 96 | 9631 | 958 | 9532 | 9482 | 9432 | 70.93 | 17.041 | 062 | 082 | 103 | 12 | 144 | 165 | 186 | 206 | 227 | 73 |
| 74 |  |  |  |  |  |  | ， |  | 9150 |  | 275 | 20 | 168 | 337 |  | 379 | 400 | 421 | 442 | 463 | 74 |
| 75 | 9277 | 92 | 175 | 24 | 9073 |  | 8971 | 8919 |  | $72 \cdot 881$ | $17 \cdot 50$ |  |  | 572 | 59 |  |  |  |  |  | 75 |
| 76 | 9001 | 8950 | 98 | 8846 | 8794 | 8742 | 8690 | 863 | 8586 |  |  |  | 848 |  |  |  |  |  |  |  | 76 |
| 77 | 872 | 86 | 8620 | 8568 | 85 | 8463 | 8410 | 8357 | 83 | 74．82 | 17.975 | 99 | －18 | 04 | 06 | 084 | 105 | 127 | 149 | 17 | 77 |
| 78 | 849 |  |  |  |  |  |  |  | 8023 |  | 208 | 2308 | 1829 |  |  | 析 |  | 析 |  |  | 78 |
| 79 | 817 | 811 | 65 | 80 | 79 | 79 | 7849 | 7795 | 774 | 76.768 | 18.4422 | 464 | 486 | 509 | 5316 | 5539 | 5762 | 5986 | 620 | 643 | 79 |
| 80 | 78 | 7842 | 7787 | 7733 | 7678 | 7624 | 7569 | 7514 | 7459 | $77 \cdot 7404$ | 18.6756 | 698 | 720 | 7435 | 76 | 88 | 8114 | 834 | 8566 | 879 | 80 |
| 81 | 762 |  |  | ${ }^{7454}$ |  |  |  |  |  |  | 18.90 | 9320 |  | 9778 | der |  | 04 | 0694 | 092 |  |  |
| 82 | 734 | 7288 | 7 |  | 681 | 67 |  | 667 | 66 | 80．65 | 19.14 | 1937 | 1889 | 212 | 235 | 259 | 517 | 5048 | 56 |  |  |
| 83 | 7067 | O11 | 6954 | 689 | 684 | 6784 | 6728 | 6671 | 6614 | 80.655 | $19 \cdot 3760$ | 3994 | 4229 | 4464 | 4699 | 4933 | 516 | 540 | 563 | 58 | 83 |
| 84 | 6791 | 6734 | 965 | 661 | 656 | 5 |  | 639 | 6332 | 627 | 19.609 | 633 | 6569 | 680 | 7044 | 728 | 751 | 775 | 999 |  |  |
| 85 | 6514 | 6457 | 6399 | 634 | 628 | 622 | 6167 | 6109 | 605 | 2599 | 19 －842 | 866 | 890 | 915 | 939 | 963 | 987 | 11 | 035 |  |  |
| 86 | 6238 | 6180 | 21 | 60 | 6004 | 594 | 86 | 5828 | 5769 | 83.571 | 20.07 | 1006 | 1249 | 149 | 1736 | 197 | 2222 | 2465 | 270 | 295 | 86 |
| 87 | 5962 | S |  | 573 | 5725 | 566 |  | 554 | 5487 | 84•542 | $20 \cdot 3037$ | 3344 | 359 | 3836 | 4082 | 4328 | 457 | 4820 | 506 | 53 |  |
| 88 | 568 | 5626 | 5566 | 5506 | 5446 | 5386 | 5326 | 5265 | 403 |  |  | 5681 | 59 | 617 | 6427 | 6676 | 692 | 5 | 742 | 析 | 88 |
| 89 | 5409 | 5349 | 5288 | 5228 | 67 | 5106 | 205 | 4984 | 4923 | 86.486 | 20.776 | 8018 | 827 | 852 | 8773 | 9025 | 927 | 9528 | 978 | ＋031 | 89 |
| 90 | 513 | 5072 |  | 1949 | 4888 | 4826 | 4765 | 4703 | 642 | 87.4580 | 21.010 | 035 | 0610 | 086 | 111 | 137 | 1628 | 188 | 213 | 239 | 90 |
|  | 485 |  |  |  | 430 |  |  |  |  |  |  | 263 |  | 3207 |  |  |  | 4237 | 4831 |  |  |
| \％2 | 4580 | 4518 | 4455 | 4393 | 4330 | 4267 | 4204 | 4141 | 4078 | 89．401 | 21.4770 | 5030 | 5290 | 5550 | 5810 | 6071 | 6331 | 6591 | 685 |  | 92 |
| 93 | 4304 | 4241 | 4178 | 4114 | 405 | 3987 | 3924 | 3860 | 3796 | 90.373 | $21 \cdot 7104$ | 7367 | 7630 | 7893 | 8156 | 8419 | 8682 | 3945 | 920 |  | 93 |
| 94 | 4028 | 3964 | 3900 | 3836 | 3772 | 3708 | 3643 | 3579 | 3515 | 913450 | $21 \cdot 943$ | 9705 | 9970 | 1236 | 0502 | 0768 | 1034 | 1299 | 1565 | 183 | 94 |
| 95 | 37 | 3687 | 3622 | 3558 | 3493 | 3428 | 3363 | 3298 | 3233 | 92.3168 | $22^{1} 1773$ | 204 | 231 | 25 | 2848 | 3116 | 3385 | 365 | 392 | 保 | 95 |
| 96 | 3475 | 3410 | 3345 | 32 | 3214 | 31 | 83 | 3017 | 2951 | 93．2885 | $22 \cdot 4108$ | 4379 | 4651 | 49 | 5194 | 5465 | 57 | 500 | 527 |  | 96 |
| 97 | 319 | 213 | 37 | 372 | 2935 | 28 | 2802 | 2736 | 2669 | 942603 | 22.644 | 6716 | 6991 | 726 | 753 | 7814 | 8088 | 8362 | 863 |  |  |
| 8 | 292 | 28 | 2789 | 2722 | 265 | 2589 | 2522 | 2455 | 2388 | 95.2320 | 22.8776 | 9054 | 9331 | 96 | 98 | －162 | 0439 | 0716 | 099 | 127 | 98 |
|  | 2646 | 2579 | 212 | 166 | 2377 | 2309 | 224 | 2174 | 106 | 96.2038 | 23.1111 | 1391 | 1671 | 195 | 2231 | 2511 | 2791 | 3071 | 3350 | 3630 | O |
| 100 | 2370 | 2302 | 234 | 2166 | 2098 | 2029 | 1961 | 1893 | 1824 | $97 \cdot 1755$ | 3．3445 | 3728 | 4011 | 4294 | 4577 | 4859 | 5142 | 5425 | 5708 | 5990 | 100 |
|  | $30^{\prime}$ | 29 | $28^{\prime}$ | 27 | $26^{\prime}$ | $25^{\prime}$ | 24 | $23^{\prime}$ | 22 | $21^{\prime}$ | $30^{\prime}$ | 29 | $28^{\prime}$ | $27^{\prime}$ | 26 | 25 | $24^{\prime}$ | $23^{\prime}$ | $22^{\prime}$ | $21^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 13 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\prime}$ | $4{ }^{\prime}$ | $42^{\prime}$ | 43＇ | $44^{\prime}$ | 45 | $46^{\prime}$ | 47 | 48 | 49 |  | 41 | 42 | 43 | $44^{\prime}$ | 45 | 46 | 47 | 48 |  |  |
|  | 9717 | 9716 | 971 | 9715 | 9714 | 97 | 9713 | 12 | 9711 | 71 | 23 | 23 | 2368 | 2371 | 2374 | 2377 | 2380 | 2383 | 2385 | 2388 |  |
|  | 9434 | 9432 | 943 |  | 9428 |  | 9425 | 9424 | 9423 | 942 |  | 47 |  | 47 | 4748 | 4754 | 475 | 4765 |  |  |  |
|  | ， | 91 | 914 |  | 9142 |  | 9138 | 9136 |  |  |  |  |  | 7114 |  | 7131 | 7139 |  |  |  |  |
|  | 8867 | 8865 | 886 | 8859 | 56 | 885 | 8851 | 8848 |  |  |  | 9462 | 94 | 9485 | 9496 | 9507 | 9519 | 9530 | 9541 | 955 |  |
| 5 | 85 |  |  |  |  |  |  |  |  | 4.855 |  |  | 1842 | 1856 | 18 | 884 | 1898 | 1913 | 1927 |  |  |
| 6 | 8301 | 8297 | 8293 |  |  |  | 8276 | 8272 | 8268 | ．826 | ． 417 | 4193 | 4210 |  | 4244 |  | 4278 | 4295 |  |  |  |
|  | 801 | 8013 | 8008 |  |  | 7994 |  |  |  |  |  | 655 | 657 |  |  | 6 | 6658 | 6678 |  |  |  |
| 8 | 77 | 7729 | 7724 |  | 7713 |  | 77 |  |  |  |  | 892 | 89 | 89 | 89 | 90 | 9037 | 90 | 908 | 910 |  |
|  | 745 |  |  |  |  |  |  | 7408 | 7402 |  |  | 1290 | 13 | 13 | 13 | 1392 | 1417 | 1443 | 1468 |  |  |
| 10 | 7169 | 7162 | 7155 | 7148 |  | 7134 | 7127 | 7120 | 13 | 9.7106 | 2．3627 | 3656 | 3684 | 3712 | 3740 | 3769 | 3797 | 3825 | 385 | 388 | 0 |
| \％ | 6886 | 68 | 6870 | 6863 | 6855 | 6848 | 6840 | 6832 | 6825 | 10.681 | 2.5990 | 6021 | 6052 | 6083 | 6114 | 61 | 617 | 6208 | 6239 | 627 | 17 |
| 12 | 66 | 6594 | 65 |  | 6569 | 656 |  |  |  | 1 |  | 838 | 842 | 845 |  | 85 |  | 85 | 86 |  | 2 |
| 13 | 631 | 6310 | 63 | 6292 | 6283 | 627 | 626 | 6256 | 6247 |  |  | 075 | 078 | 0826 |  |  | 0936 | 0973 |  |  |  |
| 14 | 60 | 6027 |  |  | 5998 | 5988 | 597 | 5969 | 5959 | 1 |  | 3 | 315 | 319 | 3236 | 327 | 3316 | 3355 | 3395 |  |  |
| 15 | 57 |  |  |  |  |  |  |  |  |  |  |  | 552 | 55 |  | 5653 | 569 | 5738 | 5780 |  | 15 |
| 16 | 54 |  |  |  |  |  |  |  |  | $15 \cdot 5370$ |  |  | 789 |  |  |  |  | 3120 |  |  | 16 |
| 17 | 518 | 51 |  |  |  | 5128 |  |  |  |  |  |  | 026 | 0311 |  |  |  | 503 |  |  |  |
| 18 | 49 | 489 | 4879 | 48 | 4854 | 4842 | 4829 | 48 | 4804 | 17479 | 25 |  | 26 | ， | 2733 | 2783 | 28 | 2885 | 2936 | 298 | 18 |
| 18 | 4620 |  |  |  |  |  | 454 | 4529 | 45 | 18450 |  | 4946 | 6 | 505 |  | 5160 | 5214 | 5268 | 532 |  |  |
| 20 | 4337 | 4324 | 431 | 4296 | 82 | 4268 | 4255 | 424 | 422 | 9.421 | ． 7255 | 7311 | 7368 | 72 | 748 | 7537 | 7594 | 7650 | 7707 | 7763 | 20 |
| 21 | 405 | 4040 | 4025 | 4011 | 3996 | 3982 | 3967 | 395 | 3938 | 20.392 | 4．9617 | 967 | 9736 | 9795 | 9855 | 9914 | 9973 | 033 | 009 |  | 21 |
| 22 | 377 |  |  | 3726 |  | 3695 | 3680 |  |  | 2136 |  |  | 2108 | 2167 |  | 22 |  | 2415 | 24 |  | 22 |
| 23 | 348 | 3472 |  |  |  |  | 3393 | 3377 |  |  |  |  | 4473 | 4538 |  | 4668 | 4733 | 4798 |  |  | 23 |
| 24 | 320 | 3188 | 3172 | 3155 | 3139 | 31 | 31 | 3089 | 307 |  | 源 | 67 | 68 | 690 | 6977 | 7045 | 7112 | 7180 | 7248 | 731 | 24 |
| 25 | 29 | 2905 | 2887 | 2870 | 2853 | 2836 | 2818 |  |  | 24．2766 | ．9068 | 91 | 9210 | 92 |  | 94 | 9492 | 9563 | 9633 |  | 25 |
| 26 | 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1872 | 1945 | 2019 |  | 26 |
| 27 | 23 | 2337 |  |  |  |  | 224 |  |  | 26.218 |  |  |  | 402 |  |  |  | 4328 |  |  | 27 |
| 28 | 207 | 2053 | 203 | 201 |  | 1976 | 1956 | 1937 | 1918 | $27 \cdot 1$ |  | 6236 | 6315 | 6394 | 6473 | 6552 | 663 | 6710 | 678 | 686 | 28 |
| 29 | ， | 1769 |  |  |  | 1689 | 1669 |  |  | 28．160 |  |  | 86 | 87 |  |  | 201 | 9093 | 91 |  | 20 |
| 30 | 150 |  | 1465 | 1444 | 1423 | 1403 | 1382 | 136 | 1340 | $29 \cdot 131$ |  | 0967 | 051 | 113 | 12 |  |  | 475 | 156 |  | 30 |
| 31 | 122 | 1202 | 1180 | 1159 | 1137 | 1116 | 1095 | 1073 | 1052 | 30．1030 | －3245 | 3332 | 3420 | 3507 | 359 | 3683 | 377 |  |  |  | 31 |
| 3 | 09 | 091 | 089 |  |  | 0829 | 0807 |  |  |  |  |  | 5788 |  |  |  | 6150 | 6240 | 633 |  | 32 |
| 33 | 065 |  | 061 |  |  |  | 0520 |  |  | 32.045 |  |  |  | 825 |  |  |  | 8623 | 871 |  | 33 |
| 34 | 037 | 0350 | 032 | 030 | 0280 | 56 | 0233 | 020 | 018 |  | 0333 | 0429 | 05 | 062 | 07 | 0813 | 0909 | 1005 | 110 |  | 34 |
| －35 | 009 |  | 0042 | －018 | 9994 | 9970 | 9946 | 9921 |  | 33 | 2696 | 2794 | 28 | 9 | 309 | 31 | 3289 | 3388 | 348 | 358 | 35 |
| －36 | 9807 | 9782 |  | 973 |  |  | 9658 |  |  | 34．958 |  |  |  |  |  |  |  | 5770 | 5872 |  | 36 |
| 37 | 95 |  | 9473 |  |  |  | 937 |  |  | $35 \cdot 929$ |  |  |  |  |  |  |  |  | 2 |  |  |
| 38 | 92 | 9215 | 9189 | 9162 |  | 9110 | 9084 | 905 |  |  | 87 |  | 9998 | ${ }^{1}$ | 02 | 032 | 0428 | 0535 | 064 |  | 38 |
| 39 | 89 |  |  |  |  |  |  |  |  |  |  |  | 236 | 2477 |  |  |  | 291 | 3028 |  |  |
| 40 | 867 | 8647 |  | 8592 |  | 8537 |  | 848 | 845 | 38.842 |  |  | 4735 | 484 |  | 507 |  | 5300 | 5413 |  | 40 |
| 41 | 83 | 8363 | 833 |  |  | 825 | 8222 |  |  | 39.813 |  |  | 710 |  |  |  |  |  |  |  | 41 |
| 42 | 81 |  | 805 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ＋065 |  |  | 42 |
| 43 | 7825 |  | 776 |  |  | 7677 | 7647 |  | 7588 | 41.755 | $10 \cdot 159$ |  | 1840 | 196 |  |  |  | 2448 |  |  | 43 |
| 44 | 754 | 75 |  |  |  | 7391 |  | 7330 | 729 |  |  |  | 42 | 43 |  | 45 |  | 48 | 49 |  | 44 |
| 45 | 725 | 722 | 7197 |  | 7135 | 7104 | 7073 |  | 7010 | 43 | 10 | 6 | 657 | 67 |  |  | 7086 | 721 | 73 |  | 45 |
| 46 | 6976 | 6944 | 6913 |  |  |  |  | 675 |  | 44.669 | 10.868 |  | 8946 |  | 9206 | 9336 | 9465 | 9595 | 9725 |  | 46 |
| 47 | 66 |  | 662 | 659 |  | 6531 | 6498 |  | 643 | 45.640 |  |  |  |  |  |  |  |  | 211 |  | 47 |
| 48 | 6410 | 6377 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 42 | 43 | 449 | 463 | 48 |
| 49 |  |  |  |  |  |  | 5924 |  |  | $47 \cdot 582$ |  |  |  | 61 |  |  |  | 67 | 688 |  | 49 |
| 50 | 5843 | 5809 | 5775 | 574 | 570 | 5671 | 563 | 5602 |  | 48.5532 | 11.8136 | 8278 | 8419 | 85 |  |  |  | 9126 | 926 | 40 | 50 |
| 51 | 55 | 552 |  |  |  |  |  |  |  | 49.524 |  |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 52 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 403 |  | 52 |
| 53 | 4994 |  | 492 |  |  | 4811 | 477 |  |  | 51.466 | 12.52 |  | 55 |  |  |  | 6123 | 6273 | 64 |  | 53 |
| 54 | 471 | 4674 | 463 | 459 | 45 | 45 | 448 | 44 | 44 |  |  | 77 | 78 |  | 819 |  |  | 865 | 880 | 8961 | 54 |
| 55 | 4428 | 4390 | 4352 | 431 | 4276 | 4238 | 420 | 4162 | 4124 | 53.408 | 12.9 | 1 | 02 |  | 05 | 07 | 08 | 103 | 19 | 13 | 55 |
| 56 | 4145 | 4106 |  |  |  |  |  |  |  | 54.379 | 13.23 |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 3861 |  | 3783 |  |  | 3665 | 362 |  |  | $55 \cdot 35$ |  |  |  |  |  |  |  |  |  |  | 57 |
| 58 | 357 |  |  |  |  |  |  |  |  | 56.3218 | 13 |  |  |  |  |  |  |  | 83 |  | 58 |
| 59 |  |  |  |  |  |  |  | 301 |  | 57－29 | $13 \cdot 9$ |  |  |  |  |  | 0401 | 056 | 073 |  | 59 |
| 60 | 3012 | 2971 | 2929 | 288 | 284 | 2805 | 2764 | 2722 | 26 | 58．2639 | $14 \cdot 1764$ |  | 2103 | 2272 |  | 261 | 2781 | 295 | 312 | 329 | 60 |
| 61 | 27 | 268 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 61 |
| 62 | 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 62 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 63 |
| 64 | 1879 | 183 | 17 | 174 |  | 1659 |  | 157 | 15 |  | $15 \cdot 1$ |  | 15 | 17 |  |  |  | 248 | 26 |  | 64 |
| 65 | 159 |  | 15 |  |  |  |  |  |  | 63.1192 | 15.35 |  | 394 | 41 |  |  |  | 486 | 504 | 523 | 65 |
| 66 | 131 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 67 |
| 68 | 0747 | 07 | 06 | 06 | 0560 | 05 | 0466 | 0418 | 03 | 6.03 | 16.06 | 08 | 105 | 12 |  |  | 1 | 20 | 220 |  | 68 |
| 69 | 046 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4393 | 458 |  | 69 |
| 70 | 0181 | 0133 | 008 | 1036 | 998 | 9939 |  |  |  | 67.9745 | $16 \cdot 53$ |  |  |  |  |  | 6578 | 677 | 697 |  | 70 |
| 71 | 9898 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 96 | 956 | 951 | 9466 | 9416 | 9366 | 9316 | 926 | 9217 | 69.91 | 17.01 | 03 | 05 |  |  |  |  | 158 | 172 |  | 72 |
|  | ¢31 |  |  |  |  |  |  |  |  | 70．887 |  |  | 28 | 508 |  |  |  |  | （120 |  | 73 |
|  | 9048 | 8997 | 89 | 8895 | 44 | 93 | 87 | 869 | 8639 | 71 | $17 \times 48$ | 505 | 526 | 54 | 56 | 58 | 6097 | 630 | 651 | 67 | 74 |
| 75 | 876 | 87 |  |  |  |  | 8455 | 8403 | 8351 | $72 \cdot 829$ | 17－7205 | 41 | 7629 |  |  | 8264 | 8476 | 8688 | 8900 |  | 75 |
| 76 | 84 | 84 |  |  |  |  |  |  |  |  | 95 | 978 |  |  |  |  |  | 咗 | 128 |  | 76 |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 236 | 2 |  |  | 236 | 矿 |  |  | 77 |
| 78 | 7916 | 786 | 78 | 7755 | 7701 | 7647 | 759 | 7539 | 7485 | $75 \cdot 74$ | 18.42 | 4513 | 4734 | 49 | 51 |  | 561 | 583 | 605 | 62 | 78 |
| 79 | 732 |  |  |  |  |  |  |  |  | 76.714 |  | 687 | 7102 | 732 |  |  | 9935 | 21 | 84 |  |  |
| 80 | 73 | 7294 | 7239 | 7184 | 7129 | 7074 | 7018 |  | 6907 | ．6852 | 18.90 | 924 | 9470 | 969 | 99 | 11 | 037 | 060 | 082 | 10 | 80 |
| 81 | 706 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 | 2754 | 298 | 砣 |  | 81 |
| 82 | 678 | 672 | 66 | 6614 | 6557 | 6501 | 6444 |  | 6330 | 79.62 | $19 \cdot 37$ | 39 | 42 |  |  | 4902 | 5134 | 5366 | 5 |  | 82 |
|  | 6500 | 6443 | 6386 |  |  |  |  |  |  |  |  | 6341 | 657 | 8310 |  | 位 | 砛 | 7748 | 矿 |  | 83 |
| 84 | 6217 | 6159 | 610 | 60 | 5985 | 59 | 586 | 581 | 5753 | 81.56 | 19.8469 | 870 | 89 | 91 | 94 | 96 | 98 | ${ }^{1} 1$ | 03 |  | 84 |
| 85 | 593 | 5875 | 5817 | 5758 |  |  |  |  | 5454 | 82.540 | 20.083 | 07 | 31 | 1553 | 1793 |  |  | 2513 | 27 |  | 85 |
| 86 | 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4896 |  |  | 86 |
|  | 536 | 5308 |  |  | 5128 | 5068 | 5007 | 4947 | 4887 |  |  | 581 | 6049 |  |  | 67 | 7033 | 析 | 寺2 |  | 87 |
| 88 | 5084 | 5024 | 496 | 490 | 48 | 47 | 47 | 4659 | 45 | 85 ＇453 | $20 \cdot 792$ | 816 | 841 | 86 | 89 | 9164 | 941 | 966 | 990 |  | 88 |
| 89 | 480 | 4 | 析 | 17 | 源 | 4484 | 443 | 437 | 4310 | 86＇4248 |  | 0534 | 0786 | 103 |  | 1540 | 179 | 204 | 285 |  | 89 |
| 90 | 45 |  | 43 | 4332 | 4270 | 4208 | 4146 | 4083 | 4021 | 87.3958 | $21 \cdot 264$ | 2900 | 3154 | 34 | 366 | 391 | 417 | 442 | 468 | 493 | 90 |
| 91 | 2235 |  |  | 4047 | 3984 | 3921 | 3858 | 3795 | 3732 |  | $21 \cdot 500$ | 52 | 55 | 51 | 603 | 62 | 6551 | 6808 |  |  |  |
| 92 | 395 | 38 |  | 3762 | 3698 | 3635 | 357 | 350 | 3444 | 89 | 21737 | 7631 | 789 | 81 | 841 | 86 | 8931 | 919 | 945 |  | 92 |
|  | 3669 | 析 |  | 寿 | 3412 |  | 3284 | 3219 | 矿 |  |  | 997 | ＋25 | 0522 | ， | 10 | 1311 | 157 | 183 | 201 | 93 |
|  | 338 | 332 | 325 | 3191 | 3127 | 30 | 2997 | 2931 | 286 | 91．28 | $22 \cdot 20$ | 236 | 262 | 28 | 31 | 34 |  | 395 | 422 |  | 94 |
| 95 | 310 | 3037 | 2972 | 2906 | 2841 | 277 | 2709 |  |  | 92．2512 | 22.4459 | 4728 |  | 5265 | 5533 | 5802 | 6070 | 6338 | 6607 |  | 95 |
| 96 | 281 |  |  | 2621 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 899 |  | 96 |
|  | 253 | 2469 | 2481 | 2336 | 2269 | 22 | 2135 | 2067 | 200 | 94.1933 | $22 \cdot 9$ | 94 | 9733 | ＋0， | 0281 | 0555 | 082 | 1103 | 析 |  |  |
|  | 225 | 218 |  | 2051 | 1983 | 19 | 1847 | 1780 | 1712 | 95．1644 | 23.1547 | 1824 | 210 | 237 | 265 | 2932 | 32 | 3486 | 376 | 4040 | 98 |
|  | 1970 | 02 |  |  |  | 162 | 保 |  |  | 154 | 233910 | 4190 | 447 | 4749 | 520 | 530 |  | S88 |  |  |  |
|  | 1687 | 1618 | 1549 | 480 | 1411 | 1342 | 1273 | 1204 | 1134 | 97－1065 | $23 \cdot 6273$ | 6556 | 6838 | 7121 | 7403 | 7686 | 7968 | 8251 | 8534 | 8816 | 100 |
|  | $20^{\prime}$ | 19 | 18 | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | $1{ }^{1}$ | $13^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ | $20^{\prime}$ |  | 18 | $17^{\prime}$ | $16^{\prime}$ | 15 | $14^{\prime}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 13 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | $51^{\prime}$ | 5\％ | $53^{\prime}$ | 54 | $55^{\prime}$ | $56^{\prime}$ | $57^{\prime}$ | 58 | $59^{\prime}$ | $0^{1}$ | 51 | $52^{\prime}$ | 53 | 54 | 55 | 56 | 57 | 58 |  |  |
|  | 971 | 970 | 97 | 97 | 97 | 97 | 97 | 9705 | 9704 | －9704 | ． 2391 | 2394 | 2397 | 2399 | 2402 | 2405 | 2408 | 11 | 414 | 2416 |  |
|  | 9420 | 941 | 941 | 9416 | 9414 | 941 | 9412 | 94 | 9409 | 1.9407 | 47 | 4788 | 4793 | 479 | 4805 | 481 | 481 | 4822 | 4827 | 4833 |  |
|  | 9130 | 9128 | 9126 | 9124 |  | 911 |  | 91 |  | ．911 | 173 | 7181 | 7190 | 7198 | 7207 | 7215 | 7224 | 7232 | 7241 | 7249 |  |
|  | 8840 | 8837 | 8834 | 8831 |  | 8826 | 8823 | 88 | 8817 | 3．8815 | 564 | 957 | 95 | 9598 | 96 | 9620 | 963 | 9643 | 9654 | 9666 |  |
| 5 | 8550 | 8546 | 854 | 8539 | 36 | 8532 | 852 | 8525 | 8522 | 4.8518 | 1.1955 | 1969 | 1983 | 1997 | 201 | 2026 | 204 | 2054 | 2068 | 208 |  |
| 6 | 826 | 8256 | 82 | 8247 | 8243 | 8239 | 8235 | 823 | 8226 | 5.8222 | 46 | 4363 | 4380 | 43 | 4414 | 4431 | ${ }^{4} 448$ | 4465 | 81 | 4498 |  |
|  | 砵 |  |  |  |  | 7945 |  |  | 7931 |  |  | 67 | 6780 | 67 | 6816 | 683 | 68 | 75 | 6895 | 6915 |  |
|  | 768 | 767 | 7668 | 7663 | 7657 | 76 | 7646 | 764 | 7635 | $7 \cdot 7629$ | ． 9128 | 9150 | 91 | 919 | 92 | 9241 | 926 | 86 | 9309 | 9331 |  |
|  | 739 | 7383 |  |  |  |  |  |  |  | 333 | 1519 | 1544 | 1570 | 15 | 1621 | 1646 | 1671 | 97 | 22 | 1748 |  |
| 10 | 7100 |  |  |  |  |  |  |  |  |  |  | 1533 | 3966 | 促 | 4023 | 405 | 4079 | 108 | 4136 | 4164 | 10 |
| 11 | 680 | 6802 | 6794 | 6786 | 6779 | 6771 | 6763 | 6756 | 6748 | 10.67 | 2.6301 | 6332 | 6363 | 6394 | 6425 | 6456 | 6487 | 6518 | 6549 | 6580 | 11 |
| 12 | 651 | 65 | 6503 | 6494 | 6486 | 647 | 646 | 646 | 645 |  |  |  |  | 87 | 882 | 88 | 88 | 29 | 8963 |  | 2 |
|  | 62 |  |  |  |  | 6184 | 6175 |  | 6157 | 12.6148 | $\cdot 1083$ | 11 | 11 | 119 | 1230 | 126 | 1303 |  | 1376 | 1413 | 13 |
| 14 | 593 | 5930 | 5920 | 5910 | 5900 | 589 | 5881 | 58 | 5861 |  | 3.34 | 3513 | 35 | 359 | 36 | 3671 | 371 | 3751 | 379 |  |  |
| 15 | 56 |  |  | 5618 |  |  |  | 5576 | 5565 | 14.5555 | 3.5865 | 5907 | 59 | 599 | 6034 | 6077 | 61 | 61 | 620 | 6246 | 15 |
| 16 | 53 |  |  |  |  |  |  |  |  | 15.5259 |  |  | 8346 | 8391 |  | 8482 |  | 8572 | 8617 |  | 16 |
| 17 | 506 |  | 5046 |  |  |  |  |  | 4 | 16. |  | 069 |  | 079 |  | 0887 |  |  | 231 |  | 17 |
| 18 | 477 | 476 | 47 | 4742 | 4729 | 471 |  |  | 4679 | 1746 | －3038 | 3089 | 3139 | 31 | 3241 | 32 | 334 | 3394 | 3444 | 349 | 18 |
|  | 4489 | 44 |  |  |  | 442 |  |  | 4383 | 18437 | 4.5429 | 5482 | 55 | 55 | 5643 | 5697 | 575 | 5804 | 5858 | 591 |  |
| 20 | 4199 | 418 | 417 | 4157 | 4143 | 4129 | 15 | 410 | 4087 | 19.4073 | 4.7820 | 7876 | 7933 | 798 | 8046 | 810 | 815 | 8215 | 827 | 832 | 20 |
| 21 | 3909 | 3894 | 3880 | 3865 | 3850 | 3836 | 382 | 3806 | 3792 | 20.3777 | 5.0211 | 027 | 0329 | 0389 | 044 | 05 | 056 | 0626 | 0685 | 74 | 21 |
| 2 | 36 |  |  |  |  |  |  |  |  | 21348 | 2602 |  |  | 278 |  | 29 |  |  |  |  | 22 |
| 23 | 332 |  | 3297 |  | 3265 |  | 323 |  | 3200 | $22 \cdot 31$ | 5.499 | 5058 | 5123 | 51 | 52 | 5317 | 5382 |  | 5512 | 557 | 23 |
| 2 | 30 | 30 | 3005 |  | 2972 | 295 |  |  |  | $23 \cdot 288$ | 73 |  |  | 75 |  | 77 |  |  | 7926 |  | 24 |
| 25 | 2749 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0128 |  |  |  | 0410 | 25 |
| 26 | 245 |  |  |  |  |  |  |  |  | 25.2295 | $6 \cdot 216$ |  | 2312 | 238 |  |  |  |  |  |  | 26 |
| 27 | 216 | 21 |  | 2112 | 2093 | 207 | 20 | 203 |  |  | 45 | 463 | 47 | 478 | 48 | 49 | 501 |  |  |  | 27 |
| 28 | 187 |  |  |  |  |  |  |  |  | $27^{\circ}$ | 69 |  | 710 | 718 | 72 | 73 |  |  | 7580 |  | 28 |
| 29 | 158 |  |  | 1528 |  | 1488 |  |  | 1427 |  | 6．933 | 94 | 95 | 95 | 966 |  |  | 991 | 9994 | ＋075 |  |
| 30 | 129 | 127 | 125 | 1236 | 1215 | 1194 | 117 | 1152 | 1131 | 29 | 1730 | 18 | 189 | 198 | 206 | 215 | 22 | 2323 | 240 | 249 | 30 |
| 31 | 1009 | 0987 | 096 | 0944 | 0922 | 0900 | 0879 | 0857 | 0835 | 30．0813 | $7 \times 121$ | 4208 | 4296 | 4383 | 447 | 4558 | 46 | 473 | 4821 | 4908 | 31 |
| 32 |  |  | 067 |  |  |  |  |  |  | 31.051 |  |  | 6692 | 678 |  |  |  |  |  |  | 32 |
| 33 | 042 | 04 | 03 | 0359 | 0336 | 0313 | 0290 | 026 | 0244 | 32 | 89 | 899 | 90 | 918 | 92 | 93 | 94 | 9555 | 9648 |  | 33 |
| 34 | 01 |  |  |  |  | －020 |  | 9972 |  | 32. | 1293 |  | 148 | 158 | 16 | 17 |  | 1966 | 2062 | 215 | 34 |
| 35 | 98 |  |  |  |  |  |  |  |  |  |  |  | 388 | 398 |  |  |  | 4376 | 4475 | 457 |  |
| 36 | 95 | 9533 | 9508 |  | 9458 |  |  |  | 9357 | 34．933 | $8 \cdot 607$ | 617 | 627 | 638 |  | 6584 |  |  |  |  | 36 |
| 37 | 92 | 9243 | 9217 |  | 9165 | 9139 | 9113 |  |  |  |  |  | 8675 | 878 |  |  |  |  |  | 407 | 37 |
| 38 |  |  |  |  |  |  |  |  | 8766 | 36－873 |  |  | 107 | 1179 |  |  |  |  | 1716 |  |  |
| 39 | 868 | 866 | 8634 | 8607 | 8579 | 8552 | 85 | 8498 |  | 37 |  | 33 | 34 | 35 | 36 | 37 | 39 | 4019 | 412 | 42 | 39 |
| 40 | 839 | 83 | 8342 | 15 | 8287 | 82 | 82 | 8203 | 8175 | 38.8146 | 9.5639 | 5752 | 586 | 5978 | 60 | 620 | 63 | 643 | 654 |  | 40 |
| 41 | 8108 | 808 |  | 8022 | 7994 |  |  |  |  |  | 9.803 | 8146 |  |  |  | 8609 |  | 8841 | 8957 |  | 41 |
| 42 | 78 |  |  |  |  |  |  |  |  | 40 | 10 |  |  |  |  |  |  |  |  |  |  |
| 43 | 75 | 749 | 7468 | 7438 |  | 7378 | 7348 | 7318 | 7288 | 41 | 10 | 2934 |  | 317 | 329 | 3419 | 3541 | 3662 | 3784 |  |  |
| 44 |  |  |  |  |  |  |  |  |  | 42. | 10.52 | 53 | 545 | 55 |  |  |  | 6073 | 6197 |  |  |
| 45 | 69 | 69 |  |  |  |  |  |  |  | 43 | 10.7 | 7721 | 7848 | 7976 | 810 |  | 835 |  | 8611 | 738 |  |
| 46 | 66 | 662 | 6594 |  | 6530 | 6497 |  |  |  | $44 \cdot 6368$ | 10.99 |  | 02 | 037 | 05 |  |  |  | 1024 |  |  |
| 47 | 63 | 63 | 6302 |  | 623 | 6204 |  |  |  |  | 11.23 |  | 26 |  |  |  | 3173 | 3305 |  |  | 47 |
| 48 | 60 | 60 | 601 | 5977 | 5944 | 5910 | 587 |  | 5809 | 46 | 11 | 490 | 503 | 517 |  |  |  | 5716 | 5852 |  |  |
| 49 | 57 | 57 | 571 |  |  | 5617 |  |  |  |  |  |  |  | 757 |  |  |  | 8127 |  |  |  |
| 50 | 54 | 5463 | 5 | 5393 | 5358 | 5323 | 5288 | 5253 | 5218 | 48.5183 | 11 | 9690 | 9832 | 997 | 1 | 02 | 0396 | 0538 | 067 | 082 | 50 |
|  | 5208 | 5172 | 5137 |  | 5065 | 5030 |  |  |  | 49.488 | 12.19 |  |  |  |  |  |  |  |  |  |  |
| 52 | 4918 | 488 | 48 | 480 | 47 | 4736 | 47 | 46 | 4627 | 50\％459 | 12.43 | 447 | 4625 | 4772 |  | 506 | 52 | 5359 | 55 | 5653 | 52 |
| 53 | 4628 | 459 | 455 | 4517 | 44 | 4443 | 44 | 43 | 4331 | 51．429 | 1267 | 68 | 702 | 717 |  |  |  | 7770 |  |  |  |
| 54 | 433 | 430 | 4262 | 4225 | 87 | 49 | 411 | 407 | 4036 | $52 \cdot 39$ | 12.91 | 92 | 9418 | 957 | 972 | 987 |  | 0181 | ¢33 |  |  |
| 55 | 404 | 400 |  | 3932 |  | 3856 | 381 | 37 |  | 53.370 | $13 \cdot 1$ |  | 1815 | 1970 | 212 | 28 | 243 |  | 仡 | 290 |  |
| 56 | 375 | 37 |  |  |  |  |  |  |  |  |  | 40 | 42 | 437 |  |  | 48 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 13.62 |  |  | 676 |  |  |  |  |  |  |  |
| 58 | 3177 | 31 | 309 |  | 3016 | 29 | 29 | 289 | 2853 | 56.2812 | $13 \cdot$ |  | 90 | 91 | 933 | 94 | 966 | 9824 | 998 | 15 | 58 |
| 59 | 2887 |  |  |  |  | 26 |  |  |  |  | 14. |  | 140 | 156 | 17 | 19 |  |  |  |  |  |
| 60 | 2597 | 2555 | 251 | 2472 | 2430 | 2388 | 2346 | 2304 | 2262 | 58．2220 | 14.3459 | 3628 | 3798 | 3967 | 4137 | 4306 |  | 4645 | 4814 |  |  |
|  | 23 | 226 | 222 | 2180 | 2137 | 209 | 205 |  |  |  | 14.58 |  |  |  |  |  |  |  |  |  |  |
| 62 | 20 | 197 |  |  |  |  |  |  |  | 60：162 | 14.82 |  |  |  |  | 91 |  |  |  |  | 62 |
| 63 |  |  |  |  |  | 15 |  |  |  | ． | ． 06 |  |  | 11 |  |  |  |  |  | 223 |  |
| 64 | 1437 | 13 | 1348 |  | 125 | 1214 | 11 |  | 1079 |  | $15 \cdot 3$ |  | 33 | 35 |  |  |  | 42 | 446 | 46 | 64 |
| 65 | 11 |  | 10 | 1011 |  |  | 08 |  |  |  |  |  |  | 596 |  | 6332 |  |  | 6882 |  |  |
| 66 | 08 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 057 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 027 | 02 | 01 |  | 0087 | －040 | 9992 |  | 989 | 65.98 | $16 \cdot 25$ | 27 | 297 | 316 | 33 |  | 37 | 39 | 41 | 43 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 578 | 5 | 5757 | 5952 |  | 硣 | 653 | 673 |  |
| 70 | 969 | 9648 | 959 | 9550 | 950 | 9453 | 9404 | 35 | 9305 | 67.925 | 16.73 | 756 | 776 | 796 | 816 | 83 | 85 | 375 | 895 | 914 | 70 |
| 7 | 94 | 935 | 93 | 9258 | 16 | 9159 | （ | 9060 | 9010 | 68 | 16．97 | 99 | 16 | 036 |  |  | 096 |  |  |  |  |
|  | 911 | 906 |  |  |  |  |  |  | 8714 | 69 | $17 \cdot 21$ |  |  | 27 |  | 31 |  |  |  | 3981 |  |
| 73 | 8827 | 8776 | 8725 | 8674 | 8623 | 8572 | 852 | 8470 | 8418 | 70－33 | $17 \times 45$ | 47 | 495 | 5160 | S36 | 55 |  |  |  |  |  |
| 5s | 85 | 848 | 843 | 382 | 8330 | 82 | 82 | 8175 | 8123 | 71 ＇807 | 17.693 | 71 | 735 | 756 | 776 | 7978 | 818 | 83 | 8604 | 881 | 74 |
| 75 | 82 |  |  |  |  |  |  |  |  | 72.7775 | 17.9324 | 953 | 974 | 995 | 1 |  |  |  | 1018 | 123 | 75 |
|  | 795 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 77 | 766 | 761 | 755 | 7505 | 745 | 7398 | 7344 | 7290 | 7236 | 74．7182 | 18.410 | 432 | 454 | 475 | 4976 | 519 | 541 | 5628 | 58 |  |  |
| 78 | 7376 | 7322 |  |  |  | 7104 |  |  |  | 75.688 | 18 | 671 | 693 | 7158 | 7378 | 7598 | 78 | 80 | 825 | 847 | 78 |
| 79 | 7086 |  | 697 | ， | 66 | 6811 | 6756 | 6700 | 6645 | $76 \cdot 658$ | 18.888 | 9111 | 9334 | 9557 | 9780 | 1003 | 022 |  |  |  | 79 |
| 80 | 67 | 6741 | 6685 | 6629 | 6573 | 6517 | 6461 | 6405 | 6349 | 77．6293 | 19．1279 | 150 | 173 | 195 | 218 | 240 | 263 | 286 | 308 | 331 | 80 |
| 81 | 65 | 64 | 63 | 6337 | 6280 | ${ }^{6224}$ | 61 | 6110 | 6053 | 78.5997 | 19.367 | 389 | 412 | 435 | 45 | 481 | 504 | 52 | 549 |  |  |
| 82 | 621 | 5159 | 610 | 5753 |  | 5 |  | S | 5 | 79．570 | 19.606 | 628 | 62 | 675 | 9987 | 21 |  |  | 913 |  | 82 |
| 83 | 592 | 5868 | 5811 | 5753 | 5695 | 5637 | 5579 | 5520 | 5462 | $80 \cdot 540$ | 19.845 | 868 | 892 | 915 | 938 | 9624 | 98 | ＋092 | 032 |  | 83 |
|  | 5636 | 5878 | 19 |  |  | 533 | 5284 | 5225 | 5166 | 510 | 20.084 | 108 | 1317 | 1554 | 1792 | 2029 | 22 | 2503 | 274 | 297 | 84 |
| 85 | 5346 | 5287 | 5228 | 5168 | 5109 | 5050 |  | 493 | 48 | 82.481 |  |  | 371 | 3954 | 419 | 433 |  | 491 | 515 |  | 85 |
| 86 | 5056 | 4996 | 4936 | 4876 | 4816 | 4756 | 4696 | 4636 | 457 | 83＇451 | 20.562 | 586 | 61 | 635 | 65 | 839 |  |  |  |  |  |
| 87 | 4766 | 4705 | 4645 | 4584 | 4523 | 4463 | 4402 | 434 | 428 | 84＇421 | $20 \cdot 8016$ | 826 | 850 | 875 | 899 | 92 | ， | 973 | 998 | 22 | 87 |
| 88 | 4476 | 4415 | 4353 | 4292 | 423 | 4169 | 4107 | 47 |  | 392 |  | 065 | 0904 | 115 | 140 | 164 | 189 | 14 | 239 |  | 8 |
| 89 | 418 | 412 | 4062 | 400 | 3938 | 3875 | 3813 | 3751 | 3688 | 86．3626 | $21 \cdot 2798$ | 3049 | 3300 | ． 3552 | 3803 | 4054 | 430 | 455 | 480 |  | 89 |
| 90 | 3896 | 3833 | 3770 | 3708 | 3645 | 3582 | 3519 | 345 | 339 | $87 \cdot 3329$ | 21.5189 | 5443 | 5697 | 59 | 620 | 645 | 671 | 696 | 722 | 747 | 90 |
|  | 3606 |  |  |  |  |  |  |  | 2097 | 88 |  |  | 809 | － | 860 |  |  | 937 |  |  |  |
| 92 | 331 | 3252 | 3188 | 3123 | 3059 | 2995 | 29 | 286 | 2801 | 89.273 | 21997 | －23 | －48 | 275 | 1010 | 1270 | 1293 | 4 | 204 | 仡 | 92 |
| 93 | 302 | 2961 | 2896 | 2831 | 2766 | 2701 | 2636 | 257 | 2506 | 90．2440 | 22.2362 | 262 | 288 | 315 | 3412 | 3675 | 393 | 420 | 446 | 47 |  |
| 94 | 273 | 267 | 26 | 2539 | 2474 | 2408 | 2342 | 227 | 2210 | 912144 | 22.4752 | 5018 | 528 | 554 | 5814 | 608 | 634 | 661 | 687 |  | 94 |
| 95 | 2446 | 2380 | 2313 | 2247 | 2181 | 2114 | 2048 | 1981 | 1914 | 92．1848 | 22.7143 | 7 12 | 768 | 794 | 8217 | 848 | 875 | 砣 | 929 |  | 95 |
|  | 215 |  |  | 1955 | 1888 | 1821 | 1754 | 1686 | 1619 | 93．1551 | 22.9534 | 980 | 1077 | 0348 | 0619 | 089 | 116 | 1432 | 170 | 197 | 96 |
|  | 1865 | 158 | 1739 | 1663 | 1595 | 1527 | 1585 | 1391 | 1323 | 94.125 | $23 \cdot 1925$ | 2199 | 2473 | 2747 | 3021 | 329 | 356 | 384 | 411 |  | 97 |
|  | 157 | 150 | 1439 | 137i | 1302 | 1234 | 1165 | 1096 | 1028 | 95.095 | 23.4316 | 4593 | 487 | 5147 | 5423 | 570 | 597 | 625 | 65 | 6807 | 98 |
|  | 1285 | 127 | 1148 | 1078 | 1009 | 0940 | 0871 | 0801 | 0732 | 96.066 | 23.6707 | 6987 | 7267 | 7546 | 782 | 8105 | 8385 | 866 | 89 | 9223 | 99 |
| 100 | 0995 | 0926 | 0856 | 0786 | 0717 | 0647 | 0577 | 0507 | 0436 | 97.03 | 23．9098 | 9381 | 9663 | 9946 | ＋228 | 5 | 793 | 1075 | 1357 | 640 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ | $\mathrm{l}^{\prime}$ | $10^{\prime}$ | ＇ |  | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ |  |  |  |  |  |
| 76 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $76^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES．

| Cosine． |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $14^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | 11 | $12^{\prime}$ | $13^{\prime}$ | 14 | 15 | $16^{\prime}$ | 17 | 18 | 19 | 10 | ， | 12 | 13 |  |  |  |  |  |  |  |
|  | 9696 | 9695 | 969 | 9694 | 969 | 96 | 969 | 96 | 96 | ． 9689 | ${ }^{2447}$ | 2450 | 2453 | 2456 | 2459 | 2462 | 64 | 67 | 2470 | 2473 |  |
|  | 939 | 939 | 938 | 938 |  | 93 |  | 938 | 9380 | 1.93 |  |  |  |  | 4917 | 4923 |  |  |  |  |  |
|  | 9088 | 908 | 90 | 90 | 9079 | 90 | 90 | 9073 | 90 |  | 7342 | 7351 | 735 | 73 | 7376 |  | 7393 |  |  |  |  |
|  | 3784 | 8781 | 8778 | 8775 | 8772 | 8769 | 8766 | 8764 | 87 |  |  | 980 | 9812 | 982 | 9835 | 984 | 985 |  |  |  |  |
|  | 8479 | 8476 | 84 | 8469 | 8465 |  | 8458 | 8454 | 84 | 484 | $1 \cdot 2237$ | 22 | 2265 | 227 | 2294 | 2308 | 2322 | 2336 |  |  |  |
|  | 8175 | 8171 | 8167 | ${ }^{8162}$ | 8158 | 8154 | 8150 | 814 | 8141 | 5.81 | 14685 | 4702 | 14718 | 473 | 4752 | 14769 | 4786 | 4803 | 4820 | 48 |  |
|  | 7871 | 7866 | 7861 | 7856 | 7851 | 784 | 7841 | 7836 | 7831 | ${ }^{6} 77826$ | 17132 | 7152 | 7172 | 719 | 7211 | 7231 | 7250 | 7270 | 729 | 731 |  |
|  | 7567 | 7561 | 7556 | 7550 | 7544 | 75 | 7533 | 7527 | 7521 | 7.7516 | 1.9579 | 9602 | 9625 | 964 | 9670 | 9692 | 9715 |  | 9760 | 978 |  |
|  |  |  |  | 728 | 723 | 7231 | 72 | 7218 | 72 |  | $2 \cdot 20$ | 2052 | 20 | 210 | 2128 | 2154 | 217 | 05 | 223 | 225 |  |
| ， | 6959 | 69 | 6945 | 6937 | 6930 | 6923 | 6916 | 6909 | 6902 | 9.689 | 2.447 | 4503 | 453 | 455 | 458 | 4615 | 4644 | 46 | 4700 | 472 | 10 |
| 11 |  | 66 |  |  | 662 | 6 | 66 |  | 65 | 10. | $2 \cdot 6$ | 69 |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 6325 | 631 | 63 | 62 |  | 62 | 11.62 | $2 \cdot 9$ | 9403 | 9437 | 947 | 95 | 9538 | 9572 | 960 | 96 |  | 帾 |
| 13 | 6046 | 603 | 60 | 6019 | 6009 | 6000 |  |  | 59 | 12.59 | 3.18 | 1853 | 189 | 192 | 19 | 2000 | 2037 | 207 | 2110 | 21 | 13 |
| 14 | 5742 | 573 | 572 | 5712 | 5702 | 5692 | 568 | 5672 | 5662 | 13.5652 | 3．4264 | 4304 | 4343 | 4383 | 4422 | ${ }_{4}^{4661}$ | 4501 | 4540 | 458 | 461 | 14 |
| 15 | 5438 | 5428 | 5417 | 5406 | 5395 | 5385 | 5374 | 5363 | 5352 | 14：5342 | $3 \cdot 6711$ | 6754 | 67 | 6838 | 6881 | 6923 | 6965 | 7008 | 7050 |  | 15 |
| 16 | 5134 | 512 | 511 | 5100 | 15088 | 507 | 506 | 50 | 5043 | 15.503 | $3 \cdot 9$ | 204 | 49 | 9294 | 9339 | 19385 | 9430 | 9475 | 9520 | 956 | 16 |
| 17 | 483 | 4818 | 48 | 4794 | 4781 | 4769 | 4757 | 4745 | 4733 | 16：4720 | 4.1606 | 1654 | 1702 | 175 | 1798 | 1846 | 1894 | 194 | 1990 | 20 |  |
| 18 | 45 | 4513 | 45 | 87 | 4474 | 4462 | 4449 | 4436 | 4423 | $17 \cdot 4410$ | 4.4054 | 410 | 4155 | 420 | 4257 | 430 | 43 | 44 | 44 |  | 18 |
| 1 |  |  |  |  |  | 4154 | 4140 | 412 | 4113 | 18.4 |  | 65 | 6608 |  |  | 621 | 6823 | 687 |  |  | 19 |
| 20 | 3918 | 3903 | 3889 | 3875 | 3861 | 3846 | 332 | 381 | 3803 | 19.378 | 4.89 | 905 | 9061 | 9118 | 9174 | 923 | 928 | 934 |  |  |  |
| 21 | 361 | 3599 | 358 |  | 3554 | 3538 |  |  |  |  | 5.1396 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4216 |  | 4340 |  | 22 |
| 2 | 3005 | 258 | 29 | 29 | 2940 | 2923 | 25 | 2581 | 2874 | $22^{2} 285$ | 5.6291 | 6356 | 642 | 648 | 6550 | 6615 | 6680 | 67 |  |  | 23 |
| 24 | 2701 | 268 | 26 | 26 | 2633 | 2615 | 2598 | 25 | 2564 | $23 \cdot 2547$ | 5.8738 | 8806 | 8874 | 894 |  | 907 | 9144 | 9212 |  |  | 24 |
| 25 | 239 | 2379 | 23 | 23 | 2326 | 23 | 22 | 2272 | 2254 | 24：2236 | $6 \cdot 1186$ | 1256 | 1327 | 139 | 146 | 153 | 160 | 1679 | 17 |  | 25 |
| 26 | 2093 | 2074 | 20 | 2037 | 2019 | 2000 | 1981 | 1963 | 1944 | 25．192 | 6．3633 | 3707 | 3780 | 385 | 39 | 400 | 4073 | 4146 | 42 | 4293 | 26 |
|  | 1789 | 177 | 17 | 17 | 171 | 169 | 16 | 1654 | 1634 | 26．161 | 6．60 | 6157 | 6233 | 630 | 63 |  | 6538 | 6614 |  |  |  |
| 28 | 1485 | 14 | 14 | 1425 | 14 | 13 | 13 | 13 | 132 | 27 | 6.85 | 860 | 868 | 87 | 88 | 89 |  | 90 | 916 | 92 | 28 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 13 |  | 15 | 163 | 17 | 29 |
| 30 | 087 | 085 |  | 0812 | 0791 | 07 | 0748 | 0726 | 0705 | 29．068 | 73423 | 3508 | 3592 | 3677 |  |  |  |  |  |  |  |
| 31 | 0572 |  |  |  | 0484 | 0462 | 0439 |  |  | 30．037 | 7587 |  |  | 613 |  | 63 |  | 6482 | 6570 | 66 | 31 |
| 32 | 0268 | 02 | 02 | 0200 |  | 0154 | 0131 | 0108 |  | 31. | 78318 | 8408 |  |  | 86 |  | 132 |  |  |  |  |
| 33 | 9964 | 99 | 99 | 98 | 9870 | 98 | 9823 | 位 | 977 | 31．9751 | － 3 | 0858 | 095 | 104 | 1138 | 1231 | 1324 | 141 | 1510 |  | ${ }^{33}$ |
| 34 | 9660 |  | 96 | 95 | 9563 | 9539 | 9514 | 9490 | 9465 | 32．9441 | 8.3213 | 3309 | 340 | 350 | 35 | 3692 | 3788 | 388 |  |  | 34 |
| 35 | 9356 | 933 | 93 | 19281 | 9256 | 9231 | 9206 | 9181 | 9155 | 33.9130 | 8.5660 | 5759 | 585 | 595 | 605 | 6154 | 625 | 635 | 6450 | 65 | 35 |
| 36 | 905 | ${ }^{9026}$ | 90 | 89 | 89 | 89 | ${ }^{8897}$ | 8872 | 8846 | $34 \cdot 8$ | $8 \cdot 810$ | 820 | 831 |  |  |  | 871 |  |  |  |  |
|  | 874 |  | 86 | 86 |  | 86 | 8589 | 8562 | 85 | 35 | 9.05 | 065 |  | 08 |  |  |  | 12 | 13 |  | 37 |
|  |  |  |  |  |  |  | 82 |  | 82 |  |  | 31 | 321 | 332 |  | 3538 |  | 375 |  |  | 38 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 7835 | 7807 | 7778 | 7 | 7721 | 769 | 7664 | 7635 | 7606 | 38.757 | $9 \cdot$ | 801 | 812 | 8236 | 834 | 846 | 857 | 8687 | 8800 | 8912 | 40 |
| 41 | 7531 | ${ }^{7502}$ | 7473 | 7443 | ${ }^{7414}$ | 7385 | ${ }^{7355}$ | ${ }_{7} 7326$ | 7296 | 39．726 | 10.0345 | 046 | 05 | 068 |  | 0923 | 103 | 11 | 12 |  |  |
| 42 |  | 719 |  |  | 7107 |  | 70 |  |  | 40.6956 | $10 \cdot 27$ | 2911 |  | 314 |  |  | 3503 |  |  |  |  |
| 43 | 6923 | 6892 | 68 | 68 | 6800 | 67 | 6738 | 6708 | 6677 | 41.6646 | 10.52 | 5361 | 5482 | 56 | 5725 | 5846 | 5967 | 608 | 62 |  | 43 |
|  |  | 6587 | 65 | 6525 | 648 | 64 | 6430 | 6399 | 6367 | $42 \cdot 63$ |  |  |  | 80 | 818 | 83 | 843 | 85 |  |  | 44 |
| 45 | 631 | 62 | 6250 | 6218 | 6186 | 6154 | 6122 | 608 | 605 | $43^{\cdot 60}$ | 11. | 02 | 0388 | 0515 | 064 | 0769 | 08 | 1023 | 115 | 127 |  |
| 46 | 6010 | 59 | 5945 | 5912 | 5879 | 58 | 5813 | 5780 | 5747 | 44.5714 | 11.2 | 27 | 284 | 2971 |  |  | 3360 | 349 |  |  |  |
|  |  |  |  |  |  | 55 | 5505 | 547 | 5437 | 45 | 11.50 | 5162 | 529 | 5427 | 55 | 5692 | 5825 | 595 |  |  | 47 |
| 48 | 54 | 53 | 53 | 5300 | 5265 | 5231 | 5196 | 5162 | 5128 |  | 1 | 7612 | 774 | 788 | 8018 | 8154 | 8289 | 842 | 856 |  | 48 |
| 49 |  |  | 50 |  | 58 | 4923 | 48 | 4853 | 4818 | 474782 | 11.9924 | ＋06 | 0201 | 03 | 0477 | 0615 | 0753 | 089 |  |  | 49 |
| 50 | 479 | 4758 | 4723 | 4687 | 4651 | 4615 | 4580 | 4544 | 4508 | $48^{\circ} 4472$ | 12.2372 | 2513 | 2654 | 279 | 2936 | 3077 | 3218 | 335 | 350 | 364 | 50 |
| 51 | 4490 | 4454 | 4417 | 4381 | 4344 | 4308 | 4271 | 4235 | 419 | $49^{4} \cdot 41$ | $\frac{12.48}{}$ | 496 |  |  |  |  | 568 | 58 |  |  |  |
| 52 | 18 | 4149 | 4112 | 4074 | 4037 | 40 | 3963 | 39 | 388 | 50.38 | 12.72 | 7413 |  |  | 785 |  | 81 |  |  |  |  |
| 53 | 3882 | 384 | 3806 | 37 | 373 | 369 | 3654 | 3616 | 357 | 51.35 | 12.97 | 98 | －013 |  | 031 | 04 | 06 | 07 | 0 |  | 53 |
| 54 |  |  |  |  |  |  |  |  |  |  |  | 231 | 246 |  | 277 | 292 | 30 | 32 | 33 | 35 | 54 |
| 55 | 327 | 3234 | 3195 | 3156 | 3116 | 3077 | 3038 | 2998 | 2959 | 53.29 | 13.46 | 476 | 49 | 5074 | 5229 | 53 | 55 | 5694 | 5849 |  |  |
| 56 | 2969 |  |  |  |  |  | 2729 | 2689 | 26 | 54.26 | 13.705 | 7214 | 7372 | 7530 | 7688 | 7846 | 8004 | 8162 | 831 | 34 | 56 |
| 5 | 26 | 26 | 25 | 2543 | 2502 | 24 | 2421 | 2380 | 2339 | 55 | 13.9504 | 9664 | 9825 |  | －147 | 0307 | 0468 | 062 |  |  |  |
| 5 | 2361 | ${ }^{23}$ | 2278 | 2237 | 188 | 21 | 21 | 17 | 2029 | 56.198 57 | 14．1951 | 2115 | 2278 | 244 | 260 | 2769 | 293 | 55 | 57 |  | 58 |
| 59 |  | 20 | 1973 | 1931 | 1888 | 18 | 18 | 1762 | 1719 | 57．167 | 14．4399 | 4565 | 473 | 489 | 506 | 5230 | 53 | 55 | 57 |  | 59 |
| 60 | 1753 | 1710 | 1667 | 1624 | 1582 | 1539 | 1496 | 1453 | 1409 | 58.136 | 14.8846 | 7015 | 718 | 7354 | 7523 | 769 | 7861 | 80 | 819 |  | 60 |
|  | 1449 | 1405 | 1362 | 1318 | 275 | 1231 | 1187 | 1143 | 1100 | 59 | 14．923 |  | 96 | 98 |  |  | 0325 | 04 | 0669 |  |  |
| 62 | 11 | 11 | 10 | 1012 | 09 | 09 | 0879 | 0834 | 079 | 60 | $15 \cdot 17$ | 19 |  |  | 24 |  |  |  |  |  |  |
|  |  |  |  | 07 | 06 | 06 | 0570 | 0525 | 0480 | 61.04 | 15．4188 | 4366 | 454 | 472 | 48 |  | 5254 | 5432 | 560 |  | 63 |
| 64 | 05 | 0491 | 04 | 0399 | 0354 | 0308 | 026 |  |  |  |  | 6 |  |  |  | 5s8 |  |  |  |  | 64 |
| 65 | 023 | ， | 0139 |  | 0047 | －000 | 9954 | 析 | 9860 | 62.9813 | $15 \cdot 9083$ | 9267 | 9450 | 963 | 981 | P000 | 01 | 03 | 05 | 0733 | 65 |
| 66 | 9928 | 9881 | 9834 | 9787 | 9740 | 9692 | 9645 | 9598 | 9550 | 63.950 | 16．1531 | 1717 | 1903 | 208 | 2275 | 2461 | 2647 | 2833 | 3019 | 320 | 66 |
| 67 | 9624 | 95 | 952 | 9481 | 9433 | 93 | 933 | 2080 | 9231 | 6 | 163978 | 4167 | 4356 | 4545 | 4734 | 4923 | 517 | 77 | 549 |  | 67 |
| 68 |  | 92 | 92 | 68 | 88 | 907 | 87 | 8980 | 8931 | 65：8882 | 16.6425 | 6617 | 68 |  | 71 | 7384 | 7576 | 776 | 795 | 81 | 68 |
|  |  |  |  | 68 | 8819 | 8769 | 8720 | 8670 | 8621 | 66．857 | 16 | 9068 | 92 | 94.3 | 961 | 984 | ＋04 | 02 | 04 |  | 69 |
| 70 | 8712 | 8662 | 86 | 8562 | 8512 | 8462 | 8412 | 836 | 8311 | 67：826 | $17 \cdot 1320 \mid$ | 1518 | 1715 | 191 | 211 | 2307 | 25 | 27 | 289 |  | 70 |
| 71 | 84 | 83 | 83 | ${ }^{82}$ | 8205 | ${ }^{8154}$ | ${ }^{8103}$ | 77 | 800 | ${ }^{68} 7$ | 1737 |  |  | 43 |  |  |  |  |  |  |  |
|  | 810 | 805 | 80 | 79 | 78 | 784 | 7795 | 774 | 769 | 6976 | $17 \% 2$ | 6418 | 662 | 68 |  | 723 | 7433 | 763 |  |  | 72 |
|  | 77 | 77 | 7695 | 7643 | 75 | 75 | 74 | 74 | 73 | $70 \cdot 732$ | $17^{\circ} 8$ | 88 | 9074 |  | 94 | 9692 | 938 | －103 | 030 |  | 73 |
| 74 |  |  |  |  |  | 7231 |  |  |  |  | 18.1110 | 131 | 152 | 1 |  | 215 | 2362 | 2571 |  |  |  |
| 75 | 硅 | 7138 | 784 | 析 |  | 6923 | 6889 | 681 | 6762 | 72.6708 | $18 \cdot 3557$ | 3759 | 398 | 4192 | 4403 | 461 | 4826 | 503 | 52 | 54 | 75 |
| 76 | 6887 | 6833 | 6778 | 6724 | 6670 | 6515 | 6561 | 6507 | 6452 | $73 \cdot 639$ | ${ }^{18 \cdot 6005}$ | 6219 | 6434 | 664 | 6862 | 7 | 7291 | 750 |  |  | 76 |
| 77 | 658 | 652 | 647 | 6418 | 6363 | 63 | 6253 | 6， | 6142 | 74.60 | 18.845 | 8670 | 888 | 910 | 932 | 95 | 55 | 997 | 1 |  | 77 |
| 78 | 627 | 62 | 616 | 61 | 605 | 60 | 5944 | 588 | 5832 | $75 \cdot 57$ | $19 \cdot 9$ | 1120 | 1340 | 156 | 178 | 200 | 22 | 243 | 26 | 28 | 78 |
| 80 | 5974 | 591 | 5862 | 580 |  | 569 | 563 | 557 | 55 | 76 |  | 357 | 37 | 401 | 423 |  |  |  |  |  | 79 |
| 80 | 563 |  | 5556 | 5499 | 5442 | 5385 | 5327 | 5270 | 5033 | $77 \cdot 5155$ | 95 | 6020 | 6246 | 6472 |  | 6923 |  | 7374 |  |  | 80 |
| 81 | 53 | 530 | 5251 | 519 | 5135 | 5077 | 5019 |  |  | 78.4844 | 19 ＇824 | 847 | 869 | 892 | 9156 | 9384 | 961 | 984 | 106 |  | 81 |
|  |  |  |  | － | 4828 | 4769 | 4711 | 4652 | 4593 | 79＊4534 | 20. | 921 | ， | 138 |  | 1 | 207 | 23 | 253 |  |  |
| 83 | 45 | 43 | 仡 | 4580 | 45 | 44 | 4402 | 4343 | 4283 | ${ }^{80} 4.423$ | 20．3137 | 3371 | 3605 | 3839 | 4073 | 43 | 41 | 4775 |  |  |  |
| 85 | 445 | 43 | 4334 | 229 | 42 | 41 | 4895 | 4034 | 3973 | 81－3913 | $20 \cdot 5584$ | 5821 | 6058 | 6295 | 6532 | 676 | 7006 | 7242 | 747 |  | 84 |
| 85 | 415 | 408 | 4029 | 3968 | 3907 | 384 | 3785 | 3724 | 3663 | 82：3602 | 20：8032 | 8272 | 851 | 8751 | 8991 | 9230 | 9470 | 9710 | 994 | ${ }^{+1}$ | 85 |
| 86 | 38 | 37 | 37 | 33 | 3600 | 3539 | ${ }^{3477}$ | 3415 | 3354 | 83221 | 21.047 | ${ }^{0722}$ | 096 | 12 | 1449 | 769 | 1934 | 217 | 241 |  |  |
| 87 | 354 | 348 | 3417 | 335 | 3293 | 3231 | 3169 | 3106 | 3044 | 84．298 | $21^{1} 2927$ | 3172 | 341 | 366 | 3908 | 4153 | 4399 | 464 | 48 |  |  |
| ${ }_{8}^{88}$ | 323 | 317 | 3112 | 273 | 29 | 2923 |  | 279 | 2734 |  | 21 |  | 587 | 611 | 63 | 66 | 6863 |  |  |  | 8 |
| 89 90 | 262 |  |  | 27 | 2372 | 23 |  | 21 |  |  | ${ }^{21} 78822$ | ${ }^{8073}$ | ${ }^{832}$ |  |  |  | 93 |  |  |  |  |
|  | 2325 | 2260 | 2195 | 21 |  | 2000 | 1935 | 1870 | 1804 | $88^{1} 173$ | $22 \cdot 27$ | 2973 | 323 | 348 | 3743 | 400 | 4256 | 45 | 476 |  | 91 |
| 92 | 2021 | 1955 | 1890 |  | 1758 | 1692 | 1627 | 1561 | 1494 | 89.1428 | 22.5164 | 5423 | 5683 | 59 | 620 |  | 620 | 69 | 720 |  |  |
| 93 | 17 | 1651 | 1584 | 121 | 14 | 1385 | 1318 | 1251 | 1185 | $90 \cdot 1118$ | 22.7611 | 7874 | 813 | 839 | 866 | 8923 | 9185 | 944 | 970 |  |  |
| 94 | 1413 | 1346 |  | 1212 | 11 |  |  | 0942 | 0875 | 91．0807 |  | 032 | 05 | 085 | 111 | 1384 | 1649 | 1914 | 217 |  | 94 |
| 95 | 1109 | 1041 | 0973 | Os | 0837 | 076 | 070 | 0633 | 10565 | $92^{2} 0497$ | ${ }_{23}{ }^{2506}$ | 2774 | 13042 | 331 | 3578 | 38 | 4113 | 4381 | 4649 |  |  |
| 96 | 080 | 036 | 0667 | 0599 | 05 | 0462 | 0393 |  |  | 93.0186 | $23 \cdot 4954$ | 5224 | 5495 |  | 6036 | 630 | 6578 | 68 | 7119 |  |  |
| 97 | 050 | 043 | 0362 | 0293 | 02 | 0154 | 0085 | ＋015 | 9945 | 93.987 | 23 | 767 | 7948 |  |  |  |  |  |  |  |  |
| 9 | 019 | 0126 | P056 |  |  |  |  |  | 96 |  | 23 | －125 | 0401 |  |  | 123 |  | 1783 |  |  |  |
|  | 9892 | ${ }_{9517}^{9822}$ | 45 | 9680 | 9303 | 9231 | 9458 | ${ }_{9088}^{939}$ | 016 | 96．89 | 24.2296 | 2575 | 285 |  |  |  | 6635 | 4250 | 4529 |  |  |
|  | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | $46^{\circ}$ | 45 | $44^{\prime}$ | $43^{\prime}$ | $42^{\prime}$ | ， |  |  | 538 | $47^{\prime}$ | $46^{\prime}$ | $4{ }^{\text {ja }}$ | $44^{\prime}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $14^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $14^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | 31 | $32^{\prime}$ | 33 | 34 | 35＇ | 36 | 37 | $38^{\prime}$ | $39^{\prime}$ | $3{ }^{\prime}$ | $31^{\prime}$ | 32 | 33 | 34 | $35^{\prime}$ | $36^{\prime}$ | $37^{\prime}$ |  |  |  |
|  | 9681 | 9681 | 9680 | 96 | 9679 | 9678 | 96 | 9676 | 9676 | ． 9675 | 504 | 2507 | 2509 | 2512 | 2515 | 2518 | 2521 | 2524 | 2526 | 2529 |  |
|  |  | 9361 | 9360 | 93 | 9357 | 9356 | 935 |  | 935 | －935 |  | 50 | 5019 | 5024 | 5030 | 5036 |  | 7 | 5053 | 5058 |  |
|  | 9044 | 9042 | 904 | 9038 | 903 | 9033 | 9031 | 9029 | 9027 | －902 | 511 | 7520 | 75 | 7537 | 7545 |  | 2 | 7571 | 757 | 75 |  |
|  | 8726 | 8723 | 8720 | 8717 | 8714 | 871 | 8708 | 705 | 8702 | ． 87 | 015 | 00 | 0038 | 004 | 006 | 0072 | 0083 | 0094 | 010 | 01 |  |
|  |  |  | 8400 | 83 | 93 | 8389 | 85 | 8382 | 8378 | －83 | $1 \cdot 2519$ | 25 | 25 | 2561 | 257 | 2589 | 2603 | 2618 | 263 | 2646 |  |
|  | 8089 | 8084 | 8080 |  | 8071 | 8067 |  |  |  | $5 \cdot 804$ |  | 5040 | 5057 | 5073 | 5090 | 5107 | 5124 | 5141 | 5158 | 5175 |  |
|  | 寿 |  | 776 | 775 | 775 | 7745 |  |  | \％ |  |  | 75 | 75 | 758 | 7605 | 7625 |  | 7665 | 7684 |  |  |
|  | 7452 | 7446 | 7440 | 7434 | 74 | 7423 | 7417 |  | 74 |  |  | 005 | 007 | 00 | 012 | 0143 | 016 | 0188 | 021 | 0233 |  |
|  |  |  |  |  |  | 7100 | 7094 |  | 708 |  | 2.2534 | 25 | 25 | 26 | 26 | 26 | 2686 | 2712 | 2737 | 276 |  |
| 10 | 6815 | 6807 | 00 | 93 | 86 | 78 | 71 | 6764 | 6756 | ． 6749 | 2.5038 | 50 | 5094 | 5122 | 5151 | 51 | 5207 | 523 | 526 | 529 | 0 |
| 11 | 64 | 64 | 64 | 64 | 6464 | 6456 | 6448 | 6440 | 6432 | 10 | 2.7542 | 7573 | 7604 | 7635 | 766 | 769 | 7728 | 7759 | 7790 | 78 | 11 |
| 12 | 6178 |  | 6160 | 615 | 6143 | 6 |  |  | 610 | 1.6 |  | 007 | 011 | 01 | 018 | 0215 | 02 | 028 | 03 |  |  |
| 13 | 585 | 585 | 5840 | 5831 | 5821 | 581 | 5802 | 5793 | 5783 | 12.577 | $3 \cdot 25$ | 258 | 262 | 265 | 2696 | 27 | 2769 | 280 | 2842 |  |  |
| 14 | 554 | 5530 | 5520 | 5510 | 5500 | 549 |  |  | 5459 | 13.54 | 3.5053 | 5093 | 513 | 517 | 521 | 5250 | 529 | 532 | 536 | 540 |  |
| 15 | 52 |  |  |  |  |  |  |  |  | ， | $3 \cdot 7557$ | 7599 | 76 | 76 | 772 | 77 | 781 | 7853 | 7895 | 793 | 15 |
| 16 | 490 | 4892 | 4880 | 4869 | 4957 | 4845 | 4833 | 4822 | 4810 | 15.4798 | 4.0061 | 0106 | 015 | 019 |  |  |  |  |  |  | 16 |
| 17 | 458 | 45 | 456 | 45 | 45 | 45 | 45 | 4 | 448 | 16.44 | 4256 | 26 | 26 | 270 | 2756 | 2804 |  | 2900 | 2947 |  | 17 |
| 18 | 4267 | 42 | 4240 | 4227 | 4214 | 4201 | 41 | 4174 | 4161 | 17.41 | 50 | 51 | 5170 | 522 | 527 | 5322 | 5372 | 54 | 547 | 5524 | 18 |
| 19 | 394 | 393 | 3920 | 3906 | 3893 | 3879 | 3865 | 3851 | 3837 | 18.382 | 4.757 | 76 | 76 | 773 | 778 | 7840 | 7893 | 7947 | 8000 |  |  |
| 20 | 3630 | 36 | 3600 | 358 | 3571 | 3557 | 3542 | 3527 | 3512 | 19349 | 5.0076 | 01 | 0189 | 024 | 030 | 035 | 0414 | 0470 | 052 | 0583 | 20 |
| 21 | 33 |  | 3280 | 3265 | 3250 | 3234 | 32 |  | 3188 | $20 \cdot 317$ | 5.2580 | 2639 | 269 | 275 | 281 | 287 | 293 | 2994 | 3053 | 311 | 21 |
| 22 | 299 |  |  |  |  | 2912 |  |  | 283 | 21.284 | － |  |  | 526 |  | 5393 |  | 5517 |  |  |  |
| 23 | 267 | 26 | 262 | 26 | 26 | 25 | 25 | 25 | 253 | 22.252 | 758 | 76 | 77 | 778 | 78 | 7911 | 797 | 8041 | 8105 |  |  |
| 24 | 235 | 23 | 2320 | 23 | 22 | 2268 | 22 | 22 | 22 | 218 | O09 | 01 | 022 | 029 | 036 | 04 | 049 | 056 | 063 | 0699 | 24 |
| 25 | 203 |  |  |  | 19 |  | 1927 |  | 1891 |  | ． 2595 |  | 273 | 280 | 287 | 294 | 30 | 308 | 315 | 3228 | 25 |
| 26 | 17 | 1699 | 1680 | 1661 | 16 | 1623 | 1604 | 1585 | 1566 | $25 \cdot 1547$ | 6.5098 | 5172 | 5245 | 5318 | 5392 | 5465 |  |  |  |  | 26 |
| 27 | 14 | 1380 | 1360 | 134 | 13 | 130 | 128 |  | 1242 | $26 \cdot 12$ |  |  |  | 783 |  |  | 805 | 813 | 8211 | 828 | 27 |
| 28 | 108 |  | 1041 |  | 1000 | 097 |  |  | 0917 | 27.089 | 1010 |  | 0264 | 0343 | 0422 | O5018 |  |  |  | 08 | 28 |
| 29 | 076 | 0742 | 072 |  | 0678 | 065 | 0636 | 06 | 0593 | 28 | 261 |  | 27 | 285 | 293 | 30 | 31 | 318 | 326 |  | 29 |
| 30 | 0444 | 0422 | 0401 | 0379 | 0357 | 0335 | 0313 | 0291 | 0269 | 29.024 | 7.5114 | 5198 | 528 | 536 | 545 | 55 | 56 | 570 | 5790 | 5874 | 30 |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  | 788 | 796 |  | 8142 | 8229 | 831 | 840 | 31 |
| 32 | 98 |  |  |  |  |  |  |  |  | 30.95 |  |  | 030 | 039 | 048 |  |  | 075 |  |  |  |
| 33 | 94 | 9465 | 94 | 9 | 9392 | 9368 | 9344 | 932 | 9296 | 31.92 | $8 \cdot 26$ |  | 281 | 2904 | 299 | 3090 | 318 | 3276 | 3369 | 34 | 33 |
| 34 | 917 |  |  |  | 907 | 左 | 21 |  | 8971 | 32 |  |  | 532 | 541 | 55 |  | 5704 | 57 | 5895 |  | 34 |
| 35 | 885 | 8826 | 88 | 8775 | 8749 | 724 | 698 | 8673 | 86 |  |  |  |  | 792 |  |  |  |  |  | 8520 | 35 |
| 36 | 85 | 8507 | 8481 | 8454 | 8428 | 8402 | 8375 | 8349 | 8322 | 34•8296 | 9.0137 | 02 | 0340 | 0441 | 0542 |  |  |  |  |  | 36 |
| 37 | 821 |  |  |  |  | 8080 | 8052 | 802 |  |  |  |  |  |  |  |  | 326 |  |  | 357 | 37 |
| 38 | 789 | 7868 | 7841 |  |  | 7757 | 7729 | 770 | 767 | 36 |  |  |  | 546 | 55 |  |  |  |  |  | 38 |
| 39 | 75 | 7549 | 752 |  |  | 7435 | 7407 | 737 | 734 | 37 | 97648 | 7758 | 7868 | 7978 | 808 |  |  | 84 | 852 | 863 |  |
| 40 | 7259 | 7230 | 7201 | 7172 | 7142 | 7113 | 7084 | 7054 | 7025 | 38．6996 | 10.0152 | 02 | 03 | 049 | 060 | 07 | 0828 | 094 | 105 | 16 | 40 |
| 41 | 69 | 6911 | 688 | 685 |  | 679 | 676 |  |  |  |  |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 662 | 65 |  |  |  | 6469 | 6438 | 64 | 637 | 40 |  |  |  |  | 56 |  |  |  |  |  | 42 |
| 43 | 6303 | 6272 | 6241 | 62 | 61 | 61 | 6115 | 6083 | 60 | 41. | 10 |  | 790 | 8027 | 81 | 826 | 839 | 85 | 8632 | 875 | 43 |
| 44 | 598 | 59 | 59 | 58 | 585 | 24 | 5792 | 5760 | 572 | 42.56 | 11 | 0291 | 04 | O |  |  |  | 1 | 1158 | 12 |  |
| 45 | 566 | 56 |  |  | 5535 | 5502 | 5469 | 5436 | 54 | 43 | 11 | 27 | 292 | 305 | 317 |  |  | 3558 |  |  |  |
| 46 | 53 | 5314 | 5281 | 5247 | 5214 | 5180 | 5146 | 5112 |  | 44.5045 |  |  | 54 |  |  |  |  | 50 |  | 634 | 46 |
|  | 50 |  |  | 4927 | 4892 | 4858 | 4823 | 4789 | 47 | 45 | 11.76 |  |  |  |  |  |  |  |  |  | 47 |
| 48 | 4711 | 4676 | 464 | 460 | 457 | 4536 | 4500 | 4465 | 4430 | 46.438 | 12.01 | 0318 |  | 058 | 072 |  |  |  |  |  |  |
| 49 | 439 | 43 | 4321 | 4285 | 4249 | 4213 | 4178 | 41 | 41 | $47 \cdot 40$ |  |  |  |  | 32 |  |  | 3652 |  |  |  |
| 50 | 407 | 4037 | 4001 | 3964 | 3928 | 3891 | 3855 | 3818 | 37 | 48.37 | 51 | 5331 | 5472 | 5612 | 57 | 58 | 6035 | 617 | 631 | 645 | 50 |
| 51 | 375 |  |  |  |  |  | 353 | 349 | 34 |  | 12.769 |  |  |  |  |  |  |  |  |  |  |
| 52 | 3437 | 33 |  |  |  |  | 32 | 31 |  | 50．30 | 13.0 |  |  |  | O78 |  | 107 | 12 |  |  |  |
| 53 | 31 | 30 | 30 | 30 | 29 | 29 | 2886 | 284 | 28 | 51.27 | $13 \cdot 27$ |  |  | 31 | 329 | 34 |  | 37 |  |  |  |
| 54 | 280 | 276 | 272 |  | 26 | 2603 | 2563 | 2523 | 2484 | 52.2 | $13 \cdot 520$ | 535 | 55 | 566 | 5813 | 596 |  |  | 642 | 657 |  |
| 55 | 248 | 244 | 240 | 2361 | 2321 | 2280 | 2240 |  | 2159 | 53.21 | 13.77 |  | 80 | 817 | 8328 | 548 | 863 | 879 | 8948 | 10 | 55 |
| 56 | 2163 | 2122 | 208 |  |  |  | 1917 |  |  |  |  |  |  |  |  |  |  |  |  | 163 | 56 |
| 57 | 18 |  | 1761 |  |  |  | 1594 | 1552 | 1511 | 55.14 |  |  |  | 3198 | 335 | 35 |  |  |  |  |  |
| 58 | 15 | 1483 | 1441 |  | 1356 | 131 | 127 | 1229 | 1186 | 56 | 14 | 5384 | 55 | 571 | 587 | 60 | 620 |  |  |  |  |
| 59 | 12 |  |  |  |  | 0992 | 0948 | 090 | 0862 | 57 | 14. |  |  | 8223 | 838 | 85 | 872 | 88 |  |  |  |
| 60 | 08 | 0845 | 0801 | 07 | 0713 | 0670 | 0626 | 0581 | 537 | 58 | $15 \cdot 0228$ | 0397 | 056 | 0735 | 090 | 107 | 124 | 141 | 1579 | 74 | 60 |
| 61 | 057 | 0526 | 0481 |  |  |  |  |  |  | 59．016 | $15^{\circ} 273$ |  |  |  |  |  |  |  |  |  |  |
| 62 |  |  |  |  |  |  |  |  |  | 59.98 | 15.5 |  |  |  | 59 | 610 | 62 |  | 663 | 6806 | 62 |
| 63 | 99 |  | 9841 |  |  |  | 9657 |  |  | 60.95 |  |  |  | 827 | 844 | 86 | 88 | 89 |  | 933 |  |
| 64 | 96 |  | 9521 |  |  | 9381 | 9334 | 9287 | 924 | 61.9 | 16.02 | 04 | 06 | 078 | 096 | 114 | 132 | 150 |  | 8 |  |
| 65 |  |  |  |  |  |  |  |  |  | 62.8 | 16.274 | 2930 | ¢ | 3 |  | 36 | 38 | 4028 | 42 | 439 |  |
|  | 89 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 865 | 8610 |  |  |  |  |  |  |  |  |  |  |  |  | 8509 |  |  |  |  |  |  |
| 68 | 83 | － | 824 |  |  | 8092 | 8042 | 79 | 794 | 65.78 | 17.025 | 045 | 06 | 083 | 102 | 12 |  | 15 | 178 | 9810 | 68 |
| 69 | 80 |  |  |  |  |  |  |  |  |  |  | 2957 |  | 极 | 353 | 373 |  |  | 43 | 451 | 69 |
| 70 | 77 | 7652 | 7601 | 755 | 7499 | 7448 | 7396 | 7345 |  | 67 | 17. | 546 | 566 | 585 |  |  |  |  |  |  | 70 |
| 71 | 73 | 73 | 7281 | 7229 | 7178 | 7126 | 7074 | 702 | 696 | 68.691 |  |  | －1 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 803 | 6751 | 6698 | 6645 | 69．65 | $18^{\circ} 027$ | 24 | 067 | 088 | 108 | 12 |  | 16 |  | 209 | 72 |
| 7 | 6748 | 6695 | 6641 | 6588 | 6535 | 6481 | 6428 | 6374 | 632 | $70 \cdot 6$ | 18.277 |  | 31 |  | 3600 | 380 |  | 221 |  |  | 73 |
| 74 | 6429 | 6375 | 6321 | 6267 | 6213 | 61 | 6105 | 6050 | 599 | 71.5942 | 18.528 | 549 | 569 | 5906 | 6115 | 632 | 65 | 674 | 6948 |  | 74 |
| 75 | 6111 | 6056 |  |  |  |  |  | 5727 |  | 10， | 18778 | 7996 | 8207 | 8419 | 863 | 88 | 9052 | 9263 | 94 | 968 | 75 |
| 76 | 5792 | 57 | 5681 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
| 77 | 547 | 5418 | 536 | 53 | 5249 | 5193 | 5136 | 5080 | 5023 | 74.49 |  | 50， | 322 |  | S175 | 3877 |  |  |  |  |  |
| 78 | 5153 |  | 5 |  |  | 4870 | 4813 | 4756 | 4699 | 75.464 | 19.5296 | 551 | 573 | 595 | 6175 | 639 | 661 | 683 | 705 | 727 | 78 |
| 79 | 4837 | 4779 | 4721 | 4664 | 4606 | 4548 | 4490 | 4432 | 4374 | 76.431 |  | 812 | 824 | 846 | 869 | 891 | 析 | 357 | 958 | 880 | 79 |
| 80 | 45 | 44 | 01 | 4343 | 4285 | 4226 | 4167 | 4109 | 4050 | $77 \cdot 399$ | 20.030 | 052 | 075 | 098 | 120 | 143 | 165 | 188 | 210 | 233 | 80 |
| 81 | 42 | 4141 | 40 | 4022 |  | 3904 | 3844 | 378 | 3726 | 78.366 | 20.28 | 3036 | 326 | 349 | 37 | 39 | 41 | ¢ | 463 |  | 81 |
| 82 | 38 | 35 |  |  | 3622 | 325 | 3522 | 源 | 340 | 79－334 | 20.53 | 55 | 577 | 600 | 623 | 64 | 669 | 69 |  |  | 82 |
| 83 | 35 | 350 | 344 | 338 | 3320 | 3259 | 3199 | 3138 | 307 | $80 \cdot 301$ |  | 85 | 827 | 8517 | 875 | 898 | 寿 |  |  | 析 | 83 |
| 84 | 324 | 硡 |  | 80 |  | 2937 | 2876 | 2814 | 2752 | 81.269 | 21.0319 | 0556 | 0792 | 102 | 126 | 150 | 173 | 197 | 2211 | 2448 |  |
| 85 | 2925 | 286 | 2802 | 2739 | 2677 |  |  |  | 2428 | 82.236 | 21－2823 | 3062 |  | 3541 | 3780 | 4020 | 4259 | 4498 | 221 | 218 | 85 |
| 86 | 260 | 2544 | 2482 | 2419 | 356 | 2293 | 2230 |  | 左 |  |  |  |  |  |  |  |  |  |  |  |  |
| 87 | 228 | 22 | 2162 | 2098 | 234 | 1971 | 1907 | 1843 | 1779 | 84.171 | 21.783 | 8076 | 8321 | 856 | 8810 | 905 | 930 | 954 | 9790 | d | 87 |
| 88 | 19 | 1906 | 1542 | 1757 | 1 | 1649 | 1584 | 1520 | 1455 | $85 \cdot 139$ | 22.033 | 0582 | 0830 | 1078 | 1326 | 1573 | 182 | 205 | 23 | 25 | 88 |
| 89 | 165 | 1587 | 1522 | 1457 | 1392 | 1326 | 1261 | 1196 | 1131 |  | 22 | 3089 | 3339 | 3590 | 384 | 409 | 434 | 459 | 484 |  | 89 |
| 90 | 13 |  | 1202 | \％ | 1070 | 100 | 0938 | 0872 | 080 | $87 \cdot 0740$ | 22.5342 | 5595 | 584 | 6102 | 635 | 660 | 686 | 711 | 736 | 762 | 90 |
| 91 | 101 | 028 |  | 085 |  |  | 0615 | 054 | 0482 | 415 | 22.784 | 810 | 835 | 8615 | 887 | 91 | 938 | 9639 | 9895 |  | 9 |
| 92 | 069 | 0629 | 0562 | 0494 | 627 | 0360 | 0292 | 225 | 157 | 89.009 | 285 | 060 | 0868 | 127 | 138 | 1645 | 190 | 216 | 242 |  | 92 |
| 93 94 | 0377 | － | 0242 | 0174 | 0106 | 1038 | 9970 | 990 | 9833 | 89.976 | 23.285 | 3115 | 3377 | 363 | 390 | 416 | 442 | 4686 | 4948 | 521 | 93 |
| 94 | 105 | 9990 | 9922 | 9853 | 9784 | 9716 | 9647 | 9578 | 9509 |  | 23.5357 | 562 | 5887 | 6151 | 641 | 66 | 6945 | 721 | 7474 | 773 | 94 |
| 95 | 9740 | 9671 | 9602 | 9532 | 9463 | 9393 | 9324 | 9254 | 9184 | 91.911 |  |  | 5837 |  | 641 | 6 |  |  | ＋00 |  | 95 |
| 96 | 942 | 9352 9033 | 9282 | 9212 | 41 | 71 | 601 | ${ }^{8930}$ | 8860 | 92．8789 | 24.0365 | 0635 | 矿 | 176 | 744 | 171 | － |  |  |  |  |
| 97 | 910 | 903 | 896 | 85 | 8 | 8749 | 8678 | 8607 | 8536 | $93 \cdot 8464$ | 24.286 | 314 | 34 | 368 | 396 | 42 | 45 |  | 5053 | 53 | 97 |
| 98 99 | 8785 | 8713 | 8642 | 8570 | 84 | 8427 | 8355 | 8283 | 8211 | 94.8139 | ${ }^{24.5372}$ | 5648 | 5924 | 6200 | 6476 | 6752 |  | 矿 | 7580 | 785 | 98 |
| 100 | 8466 | 8394 | 8322 | 8250 | 8177 | 105 | 8032 | 7959 | 7887 | 95.7814 | $24 \cdot 7876$ | 8155 | 8434 | 8713 | 8991 | 9270 | 954 | 982 | －10 | －38 | 99 |
| 100 | 8148 | 8075 | 8002 | 7929 | 7856 | 783 | 7709 | 7636 | 562 | 96.7489 | 25．0380 | 0662 | 0943 | 1225 | 1506 | 1788 | 2069 | 2351 | 2632 | 2914 | 100 |
|  | $30^{\circ}$ | $29^{\prime}$ | $28^{\prime}$ | 27 | $26^{\prime}$ | $25^{\prime}$ | 24 | 23＇ | $22^{\prime}$ | 21 | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ |  | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ |  | $21^{\prime}$ |  |
| 75 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

|  | Cosine． |  |  |  |  |  |  |  |  |  | IN |  |  |  |  |  |  |  |  |  | $14^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $4{ }^{1}$ | $42^{\prime}$ | $43^{\prime}$ | $44^{\prime}$｜ | 45 |  | 17 | 40 | $49^{\prime}$ |  |  | ， | ， | $44^{\prime}$ I |  |  |  |  |  |  |
|  |  | 9673 | 967 | 967 | 9671 | 9670 | 9670 | 96 | 96 | 966 | 2532 | 2535 | 538 | 2540 | 2543 | 2546 | 2549 | 2552 | 2554 | 2557 |  |
|  |  | 93 | 934 | 934 | 9342 | 93 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 9020 |  |  |  | 9011 |  |  |  |  |  | 7604 |  |  |  |  |  |  |  |  |  |
|  |  | 8694 |  |  | 8685 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 83 | 8363 |  |  |  |  |  | 834 | 4833 | 12660 | 2674 | 2688 |  | 2716 | 2730 | 274 | 2758 | 2772 |  |  |
|  | 3045 | 8040 | 8036 | 803 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 7714 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7393 | 738 | 7381 | 7376 | 7370 | 7364 | 73 | 7352 | 73 |  |  | ${ }^{2278}$ | 0301 | 0323 | 46 | ${ }^{0368}$ | 0391 | 0413 |  |  |  |
|  |  | 70 |  |  |  | 7034 | 70 | 7021 | 701 |  | 2788 | 2813 | 283 | ${ }^{2864}$ | 89 | 14 |  | 2965 |  |  |  |
| 左 | 6742 | 673 |  | 6719 | $67 / 2$ |  | 6697 | 669 | 6682 | 667 | 5320 | 5348 | 537 | 5404 | 5432 | 5460 |  | 516 | 5545 | 5573 |  |
| 11 | 6416 | 6408 | 639 | 6391 | 6383 | 6375 | 636 | 6359 | 6351 | $10^{10634}$ | 27851 | 7882 | 7913 | 794 | 7975 | 8006 | 8037 | 8068 |  |  |  |
| 12 |  | 60 |  | 6063 | 54 | 6046 | 60 |  |  | 11.60 | 383 | 0417 | 04 | 0485 | 18 | 52 | 0586 |  |  |  |  |
| 13 |  |  |  |  | 5726 | 5716 | 5706 |  |  | 12.5 | 2917 |  |  |  |  |  |  | 3171 |  |  | 析 |
| 12 | 54 | 54 |  | 5407 | 538 |  |  |  |  |  |  |  | 55 |  |  | 5644 |  | 572 |  |  |  |
| 15 | 5112 | 510 |  | 5079 | 5068 |  | 5046 | 5035 |  |  | $3 \cdot 7979$ |  |  | 8106 | 8148 |  |  | 82 | 83 |  | 15 |
| 16 | 4 | 47 | 47 | 4751 |  |  |  |  |  | 15.46 | ． 0511 |  |  |  |  |  |  |  |  |  | 16 |
| $17$ | 446 | 4 | 44 | 4423 | 4410 | 43 | 43 | 13 |  | 16.43 | 4．3043 |  | 3139 | 3187 | 3235 |  |  |  |  |  | 17 |
| $18$ | 413 | 412 |  |  |  |  |  |  |  |  |  |  | 56 |  |  |  |  |  |  |  | 18 |
| 19 | 389 |  | 3781 |  | 53 | 3739 | 3725 |  | 369 |  | $4 \cdot 8107$ |  |  |  |  |  |  | 8481 <br> 1033 | ${ }^{8535}$ |  | 19 |
| 20 |  |  |  |  |  |  |  |  |  | 19.33 | 5.0639 |  |  |  |  |  |  |  |  |  |  |
| 21 | 315 | 31 | 3126 |  |  |  |  |  |  |  | $5 \cdot 3171$ |  |  |  |  |  | 3525 |  |  |  | 21 |
| 22 | 283 | 28 |  | 2783 |  | 2750 | 27 | 27 | 270 | 21.26 | ．5703 | 57 | 58 | 5889 | 5951 | 6012 | 274 | 613 | ${ }^{6198} 8$ |  | ${ }^{22}$ |
| 23 | 25 | 24 |  | 2455 |  | 24 | 24 | 238 | 236 | $22^{23}$ | 8235 | 8300 | 8364 | 8429 | 8494 |  | 8623 |  |  |  | 23 |
| 2 |  | 1 |  | 2127 |  | 2091 | 20 |  | 203 |  | 6.0767 | 083 |  |  |  | 1104 |  |  |  |  |  |
| 25 | 185 | 183 | 181 | 1798 | 1780 | 17 | 17 | 172 | 1706 | 24.168 | 6.3299 | 3369 | 3439 | 3510 | 3580 |  | 3721 | 379 | 386 |  | 25 |
| 26 | 152 | 150 | 145 | 147 |  | 14 |  |  |  | 25 |  |  |  |  |  |  |  |  |  |  | ${ }^{26}$ |
| 27 | 12 | $1182$ |  | 1142 |  | 11 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 29 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $33$ | 92 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 34 | 892 | 88 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 666 |  |  |  |  |
| 35 | 85 | － 55 | 8544 | 8518 |  |  |  |  |  | 33．836 | $8 \cdot 8618$ | 8717 |  |  |  |  |  |  |  |  |  |
| 36 | 826 | 82 | 8216 | 8190 | 8163 | 8137 | 8110 |  |  | 34－80 |  | 1252 | 1353 |  | 1555 |  |  |  |  |  | 36 |
| 37 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4515 |  |  |
| 38 |  |  |  |  |  | 747 | 7449 |  | 739 | 36.73 | 6214 | 6321 | 64 | 65 | 6642 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 |  |  |  | 6878 | 48 | 6818 | 6789 | 6759 |  |  |  |  |  |  | 1728 | 18 |  |  |  |  |  |
| 41 | 66 | 6610 |  |  | 6519 | 64 |  |  |  |  | $10 \cdot 3310$ |  |  |  |  |  |  |  |  |  |  |
| $42$ | 63 |  |  | 6221 |  | 61 |  |  |  | 40.60 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 5830 |  |  |  |  |  |  | 91 | 923 | 93 | 94 |  |  |  |  |  |
| 44 | 56 | 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 | 53 | 53 |  |  |  |  |  |  |  |  | 11.3938 |  |  | 4318 | 4444 | 4571 | 4697 | 4824 |  |  |  |
| 46 |  |  |  |  |  |  |  |  |  |  |  | 6599 |  |  |  |  |  |  |  |  |  |
| 47 | 468 | 465 |  | As |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 | 435 | 432 |  | 4253 |  | 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 447 |  |  |  |  |  |  |  |
| 50 | 370 | 367 | 363 | 3597 | 3560 | 35 | 3486 |  | 3412 | 48.33 | 12．65 |  | 687 |  | 7160 | 7301 | 744 | 758 | 7723 |  |  |
|  | 338 | 334 | ${ }^{3307}$ | 326 | ｜3231 | 319 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $52$ |  |  |  |  |  |  |  |  |  |  |  |  | 1954 |  | 22 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 24 | 51 | 13. | 4343 | 4492 | 464 | 47 |  |  |  |  |  |  |
|  | 2 | 研 | 2 |  |  |  |  |  |  |  | 13.6 |  |  | 71 |  |  |  |  |  |  |  |
| 55 |  | 20 |  |  |  |  |  | 1794 | 1753 |  | 13 |  |  |  |  |  |  |  |  |  |  |
| 56 |  |  |  |  |  |  |  |  |  |  | $14 \cdot 17$ |  |  | 226 |  |  |  |  |  |  |  |
|  | 1427 | 1 | 13 |  |  |  |  |  |  |  |  |  |  | 480 |  |  |  |  |  |  |  |
|  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 | 04 |  |  |  |  |  |  |  |  | 58.00 | $15 \cdot$ |  | 2255 | 242 | 259 | 2761 | 2930 |  | 3267 |  |  |
| 61 | 01 | 00 |  |  |  |  |  |  |  |  |  | 4 | 14 | 64 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 947 | 94 |  |  |  |  |  |  |  | 60．90 | $15 \cdot 95$ |  |  | －045 | 0222 |  | 057 |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  | $61 \cdot 87$ |  |  |  |  |  |  |  |  |  |  |  |
| 65 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 66 | 84 | 8445 |  |  |  | 82 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 79 |  |  |  |  |  |  | ＋0 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 69 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 70 | 71 |  |  |  |  |  |  |  |  |  |  | 7434 |  |  | 8024 |  |  |  | 18812 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 1996 | ＋1 | 0368 |  |  |  |  |  |  |  |
|  | des | 648 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 73 | 6213 |  |  |  |  |  |  |  |  |  |  |  | 5243 |  |  |  |  |  |  |  |  |
| 74 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 76 | 52 | 518 | 51 | 5067 |  | 4955 |  | 4842 | 4786 | 73.47 |  | 2642 |  | 3070 | 328 |  |  |  | 43 |  |  |
| 77 | 49 | 485 | 47 | 4731 | 4682 | 4625 | 4568 | 451 | 44 | 74.43 |  | 5177 | 53 | 56 | 582 |  |  |  | 669 |  |  |
| 8 | 4584 | 452 | ． 44 | 441 |  |  | 423 | 418 | 4122 | 75.4 | 19 | 77 | 79 | 81 | 837 |  |  |  |  |  | 78 |
| 79 |  |  | 4142 |  |  |  | 357 | 35 |  |  |  |  |  |  |  |  |  |  |  |  | 79 |
| 80 | 393 |  |  |  |  |  |  |  | 13459 | 77 |  |  |  |  |  |  |  |  |  |  |  |
| 81 |  |  |  |  |  |  |  | 318 | 172 |  |  | 5316 |  |  |  |  |  |  |  |  |  |
|  |  | 3220 |  |  |  | 2978 |  |  |  | 79 |  | 785 | 808 |  |  |  |  |  |  |  |  |
| 83 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 84 |  | 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 | 230 | 2240 |  |  |  |  | 1926 | 1863 | 1800 | $182 \cdot 1$ |  |  | 5694 | 5933 | 617 |  |  |  |  |  |  |
| 86 |  |  | 1850 | 17 | 1723 |  |  | 153 | 1468 | 83. | 21.77 | 79 | 8232 | 847 | 87 | 895 |  |  |  |  | 86 |
| 87 | 1651 | 1587 | ${ }_{1523}^{1196}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 87 |
| 88 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 6846 |  |  |  |  |
| 90 | 0674 | 060 | 054 | 047 | 0408 | 0341 | 0275 | 020 | 014 | $87 \cdot 007$ | 2278 | 8129 | 838 | 863 | 8889 | 14 | 939 | 9648 | 990 | 1 | 90 |
|  |  | 02 |  |  |  | 10 | 09 | 9877 | 9809 |  | 23 | 0664 | 09 | 1176 | 143 | 1688 | 1944 |  |  |  |  |
| 9 |  |  |  |  |  |  | ， |  | 9478 |  |  | 319 | 34 | 3716 | 3975 | 42 | 449 |  |  |  |  |
|  |  | 9628 |  |  | 9422 | 9353 | 9284 | 9215 | 46 | 89.90 | $23 \cdot 5$ | 573 |  | 6257 | 6518 |  |  |  |  |  |  |
|  |  | 9301 |  |  |  | 9023 | 8953 |  | 8814 | 90．874 |  | 826 | 853 | 879 |  | 932 |  |  |  |  |  |
| 95 |  | 3974 | 8904 | 8834 | 8764 | 869 | 8623 | 8553 | 848 | 91－84 | $24 \cdot 05$ | 080 | 107 | 133 | 160 | 187 | 213 |  | 267 |  |  |
|  | 8719 | ${ }^{8648}$ | ${ }^{8577}$ |  |  |  |  | ${ }^{822}$ | 8150 |  |  |  | 3608 | 3878 |  |  |  |  |  |  |  |
|  | 8393 | 8321 |  |  |  | 8035 |  |  |  | $93 \cdot 77$ | 24.55 |  | 6145 | 6418 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7415 | 734 | 7268 | 7194 | 120 | 7046 | 6972 | ${ }_{689}$ | 6823 | 96．6749 | 25.3195 | 3477 | 12758 | 4039 | 4321 | 4602 | 883 | 165 | 5446 | 5727 | 100 |
|  | $20^{\prime}$ | $19^{\prime}$ |  | $17^{\prime}$ | $16^{\prime}$ | $15^{\circ}$ |  |  |  | $11^{\prime}$ |  |  |  |  | $16^{\prime}$ | $15^{\prime}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $14^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $14^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | $51^{\prime}$ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | $58^{\prime}$ | $59^{\prime}$ | $50^{\prime}$ | 51 | $52^{\prime}$ | 53 | $54^{\prime}$ | $55^{\prime}$ | 56 | $57^{\prime}$ | $58^{\prime}$ | 59 |  |
|  | 9667 | 9666 | 9665 | 96 | 96 | 96 | 9662 | 9662 | 9661 | ．9660 | ${ }^{2560}$ | 2563 | 2566 | 25 | 2571 | 2574 | 25 | 2580 | 2583 | 2585 |  |
|  | 9333 | 9332 | 9331 | 9329 | 9328 | 9326 | 9325 | 9323 | 9322 | 1.9320 | ． 5120 | 51 | 5131 | 513 | 5143 | 5148 | 5154 | 5160 | 5165 | 5171 |  |
|  | 9000 | 8998 | 8996 | 8994 | 8991 | 8989 | 8987 | 8985 | 8982 | $2 \cdot 8980$ | 7680 | 76 | 7697 | 77 | 7714 | 7722 | 7731 | 7739 | 7748 | 7756 | 3 |
| 4 | 8667 | 8664 | 8661 | 8658 | 8655 | 8652 | 8649 | 8646 | 8643 | 3.8640 | 1.0240 | 0252 | 0263 | 0274 | 0285 | 0297 | 030 | 0319 | 0330 | 0342 | 4 |
| 5 | 8334 | 8330 | 8326 | 8323 | 8319 | 8315 | 8311 | 8308 | 8304 | 4－8300 | $1 \cdot 2800$ | 2814 | 2829 | 2843 | 2857 | 2871 | 2885 | 2899 | 2913 | 2927 | 5 |
| 6 | 8000 | 7996 | 7992 | 7987 | 7983 | 7978 | 7974 | 7969 | 7965 | 57960 | 1.5360 | 5377 | 5394 | 5411 | 5428 | 5445 | 5462 | 5479 | 5495 | 5512 | 6 |
| 7 | 7667 | 7662 | 7657 | 7652 | 7646 | 7641 | 7636 | 7631 | 7625 | 6.7620 | 1.7921 | 7940 | 7960 | 7980 | 7999 | 8019 | 803 | 8058 | 8078 | 8098 |  |
|  | 7334 | 7328 | 7322 | 731 | 7310 | 7304 | 7298 | 7292 | 7286 | 77280 | $2 \cdot 0481$ | 0503 | 0526 | 0548 | 0571 | 0593 | 0616 | 0638 | 0661 | 0683 |  |
|  | 7001 | 6994 | 6987 | 698 | 6974 | 6967 | 6960 | 6954 | 6947 | 8.6940 | $2 \cdot 3041$ | 3066 | 3091 | 3117 | 3142 | 3167 | 3193 | 3218 | 3243 | 3268 |  |
| 10 | 6667 | 6660 | 6653 | 6815 | 6638 | 6630 | 6623 | 6615 | 6608 | $9 \cdot 6600$ | 2.5 | 5629 | 565 | 568 | 5713 | 5741 | 577 | 5798 | 5826 | 5854 | 10 |
| 11 | 6334 | 6326 | 631 | 63 | 6301 | 629 | 6285 | 627 | 626 | 10．626 | 81 | 81 | 82 | 82 | 82 | 8316 | 8345 | 83 | 8408 | 8439 | 11 |
| 12 | 6001 | 5992 | 5983 | 5974 | 5965 | 5956 | 5947 | 5938 | 5929 | 11.5920 | $3 \cdot 0721$ | 0755 | 0788 | 0822 | 0856 | 0890 | 09 | 0957 | 09 | 10 | 12 |
| 13 | 5668 | 5658 | 5648 | 5639 | 5629 | 5619 | 5609 | 5600 | 5590 | $12 \cdot 5580$ | 3．3281 | 3318 | 3354 | 3391 | 3427 | 3464 | 3500 | 3537 | 3573 | 3610 | 13 |
| 14 | 5334 | 5324 | 5314 | 5303 | 5293 | 5282 | 5272 | 5261 | 5251 | 13.5240 | 3.5841 | 5881 | 5920 | 5959 | 5999 | 6038 | 607 | 6117 | 6156 | 6195 | 14 |
| 15 | 5001 | 4990 | 4979 | 4968 | 4956 | 4945 | 4934 | 4923 | 4911 | 14.4900 | $3 \cdot 8401$ | 8443 | 8486 | 8528 | 8570 | 8612 | 8654 | 8696 | 8739 | 8781 | 15 |
| 16 | 4668 | 4656 | 4644 | 4632 | 4620 | 4608 | 4596 | 4584 | 4572 | 154560 | 4．0961 | 1006 | 1051 | 10 | 1141 | 1186 | 123 | 1276 | 1321 | 136 | 6 |
| 17 | 4335 | 4322 | 4309 | 4297 | 4284 | 4271 | 4258 | 4246 | 4233 | 164220 | 435 | 35 | 3617 | 36 | 3713 | 3760 | 38 | 65 | 3904 | 3951 | 17 |
| 18 | 4001 | 3988 | 3975 | 3961 | 3948 | 3934 | 3921 | 390 | 3894 | 17.3880 | 6081 | 6132 | 6183 | 6233 | 6284 | 6335 | 638 | 6436 | 6486 | 653 | 18 |
| 19 | 3668 | 3654 | 3640 | 3626 | 3611 | 3597 | 3583 | 3569 | 3554 | 18.3540 | 4．8642 | 8695 | 8748 | 8802 | 8855 | 8909 | 8962 | 9015 | 9069 | 912 | 19 |
| 20 | 3335 | 3320 | 3305 | 3290 | 3275 | 3260 | 3245 | 3230 | 3215 | 19.3200 | 5．1202 | 1258 | 1314 | 1370 | 142 | 483 | 153 | 159 | 1651 | 708 | 20 |
| 21 | 3002 | 2986 | 297 | 29 | 2939 | 2923 | 2908 | 28 | 287 | $20 \cdot 28$ | 5.3762 | 3821 | 388 | 393 | 399 | 405 | 4116 | 41 | 42 | 4293 | 21 |
| 22 | 2668 | 2652 | 2636 | 261 | 2603 | 2586 | 2570 | 2553 | 2537 | $21 \cdot 2520$ | 5.632 | 6384 | 6446 | 6507 | 65 | 6631 | 669 | 6755 | 68 | 6878 | 22 |
| 23 | 2335 | 2318 | 2301 | 228 | 2267 | 224 | 2232 | 2215 | 2198 | 22.218 | 5.88 | 8947 | 9011 | 907 | 9141 | 9205 | 927 | 9334 | 93 | 9464 | 23 |
| 24 | 2002 | 1984 | 1966 | 1948 | 1930 | 1912 | 1894 | 1876 | 1858 | $23 \cdot 1840$ | 6.1442 | 1509 | 1577 | 1644 | 1712 | 1779 | 184 | 1914 | 1982 | 2049 | 24 |
| 25 | 1669 | 1650 | 1631 | 1613 | 1594 | 1575 | 1557 | 1538 | 1519 | $24 \cdot 1500$ | 6.4002 | 4072 | 4143 | 4213 | 4283 | 4353 | 4424 | 4494 | 4564 | 4635 | 25 |
| 26 | 1335 | 1316 | 1297 | 1277 | 1258 | 1238 | 1219 | 1199 | 80 | $25^{\circ}$ | 6.6562 | 663 | 6708 | 678 | 6855 | 69 | 7001 | 7074 | 7147 | 7220 | 26 |
| 27 | 1002 | 0982 | 0962 | 0942 | 0922 | 0901 | 0881 | 0861 | 084 | 26.0820 | ．91 | 9198 | 9274 | 935 | 94 | 950 | 9 | 9654 | 2318 |  | 27 |
| 28 | 0669 | 0648 | 0627 | 0606 | 0585 | 0564 | 0543 | 0522 | 05 | 27．0480 | $\cdot 16$ | 1761 | 1840 | 1918 | 19 | 207 | 215 | 2233 | 2312 | 23 | 28 |
| 29 | 0336 | 0314 | 0292 | 0271 | 0249 | 0227 | 0206 | 0184 | 0162 | 28.0140 | 42 | 4324 | 4405 | 4487 | 4569 | 4650 | 473 | 4813 | 4895 | 97 | 29 |
| 30 | ＋002 | 9980 | 9958 | 9935 | 9913 | 9890 | 9868 | 9845 | 9823 | $28^{\prime 9800}$ | ． 6802 | 6887 | 6971 | 705 | 7140 | 224 | 7309 | 7393 | 7477 | 56 | 30 |
| 31 | 9669 | 9646 | 9623 | 9600 | 9577 | 9553 | 9530 | 950 | 9484 | 29 | 7.9363 | 94 | 953 | 962 | 9711 | 9798 | 9885 | 99 | 60 | 0147 | 31 |
| 32 | 9336 | 9312 | 9288 | 9264 | 9240 | 9216 | 9192 | 9168 | 9144 | 30.9120 | 8.1923 | 2013 | 2103 | 219 | 2282 | 237 | 24 | 25 | 42 | 27 | 32 |
| 33 | 9003 | 8978 | 8953 | 8929 | 89 | 887 | 8855 | 8830 | 8805 | $31 \cdot 878$ | ＊4483 | 4576 | 4668 | 476 | 4854 | 494 | 503 | 513 | 5225 | 5318 | 33 |
| 34 | 8669 | 8644 | 8619 | 8593 | 85 | 8542 | 8517 | 8491 | 8466 | 32．8440 | 70 | 7138 | 723 | 733 | 742 | 752 | 761 | 771 | 7807 | 7903 | 34 |
| 35 | 8336 | 8310 | 8284 | 8258 | 8232 | 8205 | 8179 | 53 | 8127 | $33 \cdot 8100$ | 603 | 9701 | 980 | 989 | 99 | －095 | 0193 | 0292 | 0390 | 0488 | ＇35 |
| 36 | 8003 | 797 | 7949 | 7922 | 7895 | 7868 | 7841 | 7814 | 78 | 34．7760 | 92163 | 226 | 236 | 2467 | 2568 | 26 | 2770 | 28 | 2973 | 3074 | 36 |
| 37 | 7670 | 7642 | 7614 | 7587 | 7559 | 753 | 7504 | 7476 | 7448 | $35 \cdot 7420$ | 9.472 | 4827 | 4931 | 503 | 5139 | 5243 | 534 | 5451 | 5555 | 565 | 37 |
| 38 | 7336 | 730 | 7280 | 7251 | 7223 | 7194 | 7166 | 7137 | 7109 | 36.7080 | $9 \cdot 72$ | 7390 | 7497 | 760 | 77 | 7817 | 792 | 803 | 81 | 82 | 38 |
| 39 | 7003 | 6974 | 6945 | 6916 | 6887 | 57 | 828 | 6799 | 6770 | 37＊6740 | ． 9843 | 9953 | ＋062 | 017 | 0282 | 0391 | 0501 | 061 | 1 | 083 | 39 |
| 40 | 6670 | 6640 | 6610 | 6580 | 6550 | 6520 | 6491 | 6461 | 6430 | 38.6400 | 10.2403 | 2516 | 2628 | 274 | 2853 | 2966 | 3078 | 319 | 3303 | 341 | 40 |
| 41 | 633 | 630 | 6275 | 6245 | 621 | 6183 | 615 | 612 | 6091 | 39.6060 | 10.49 | 50 | 519 | 530 | 542 | 5540 | 5655 | 57 | 5885 | 6001 | $\frac{41}{41}$ |
| 42 | 6003 | 5972 | 5941 | 5909 | 5878 | 5847 | 5815 | 5784 | 5752 | 40.5720 | 10.7523 | 7642 | 7760 | 787 | 799 | 8114 | 823 | 835 | 8468 | 858 | 42 |
| 43 | 5670 | 5638 | 5606 | 5574 | 5542 | 5510 | 5477 | 5445 | 5413 | 41.5380 | 11.00 | 020 | 0325 | 044 | 056 | 068 | 080 | 093 | 105 | 117 | 43 |
| 44 | 5337 | 5304 | 5271 | 5238 | 5205 | 5173 | 40 | 107 | 5074 | $42 \cdot 5040$ | 11.26 | 276 | 289 | 30 | 3138 | 3262 | 338 | 350 | 363 | 375 | 44 |
| 45 | 5004 | 4970 | 4936 | 4903 | 4869 | 4836 | 4802 | 68 | 34 | $43 \cdot 4700$ | 11.5204 | 5330 | 5457 | 5583 | 57 | 58 | 59 | 60 | 16 | 6342 | 45 |
| 46 | 4670 | 463 | 4602 | 4567 | 4533 | 4499 | 4464 | 4430 | 4395 | 44：4361 | 11 | 7893 | 8022 | 8152 | 8281 | 8410 | 8540 | 8669 | 8798 | 8928 |  |
| 47 | 4337 | 4302 | 4267 | 4232 | 4197 | 4162 | 4126 | 4091 | 4056 | $45 \cdot 4021$ | 12.0324 | 0456 | 0588 | 0720 | 0852 | 0985 | 1117 | 1249 | 1381 | 151 | 47 |
| 48 | 4004 | 3968 | 3932 | 3896 | 3861 | 3825 | 3789 | 3753 | 3717 | 46．3681 | 12.2884 | 3019 | 3154 | 328 | 3424 | 3559 | 369 | 3828 | 3963 | 409 | 48 |
| 49 | 3671 | 3634 | 3597 | 3561 | 3524 | 3488 | 3451 | 3414 | 3377 | $47 \cdot 3341$ | 12.5444 | 5582 | 5720 | 585 | 5995 | 6133 | 627 | 6408 | 6546 | 668 | 49 |
| 50 | 3337 | 3300 | 3263 | 3225 | 3188 | 3151 | 3113 | 3076 | 3038 | $48 \cdot 3001$ | 12.8004 | 8145 | 8285 | 8426 | 8566 | 8707 | 8848 | 8988 | 9129 | 926 | 50 |
| 51 | 3004 | 29 | 292 |  | 285 | 2814 | 2775 | 2737 | 2699 | $49 \cdot 2661$ | 13.0564 | 0708 | 085 | 099 | 138 | 12 | 142 | 1568 | 17 |  | 51 |
| 52 | 2671 | 2632 | 2593 | 2554 | 2516 | 2477 | 2438 | 2399 | 2360 | 50．2321 | 13.3124 | 3270 | 3417 | 3563 | 3709 | 3855 | 4001 | 4148 | 4294 | 4440 | 52 |
| 53 | 2338 | 2298 | 2259 | 2219 | 2179 | 2140 | 2100 | 2060 | 2020 | 51．1981 | 13.5684 | 5833 | 5982 | 6131 | 6280 | 6429 | 6578 | 6727 | 6876 | 702 | 53 |
| 54 | 2004 | 1964 | 1924 | 1883 | 1843 | 1803 | 1762 | 1722 | 1681 | 52．1641 | 13.8244 | 8396 | 8548 | 870 | 8852 | 9004 | 9155 | 9307 | 9459 |  | 54 |
| 55 | 1671 | 1630 | 89 | 1548 | 1507 | 1466 | 24 | 83 | 42 | 53．130 | 14.0805 | 959 | 1114 | 12 | 1423 | 1578 | 1732 | 1887 | 20 | 2196 | 55 |
| 56 | 1338 | 1296 | 1254 | 12 | 71 | 1129 | 1087 | 1045 | 1003 | 54．096 | 14.3365 | 3522 | 3679 | 3837 | 3994 | 415 | 4309 | 4467 | 4624 | 4781 | 56 |
| 57 | 1005 | 0962 | 092 | 0877 | 0834 | 0792 | 0749 | 0706 | 0663 | $55^{\circ} 0621$ | 14.5925 | 6085 | 6245 | 6405 | 65 | 6726 | 688 | 7046 | 7206 | 7367 | 57 |
| 58 | 0671 | 0628 | 0585 | 0541 | 0498 | 0455 | 0411 | 0368 | 0324 | 56.0281 | 14.8485 | 8648 | 8811 | 8974 | 9137 | 9300 | 946 | 9626 | 9789 | 9952 | 58 |
| 59 | 0338 | 0294 | 0250 | 206 | 0162 | 0118 | 0074 | －029 | 9985 | 56.9941 | 15．1045 | 1211 | 1377 | 1543 | 1708 | 1874 | 2040 | 2206 | 2372 | 253 | 59 |
| 60 | ＋005 | 9960 | 9915 | 9870 | 926 | 9781 | 9736 | 969 | 9646 | 57．9601 | $15 \cdot 3605$ | 3774 | 3942 | 4111 | 4280 | 4448 | 4617 | 4786 | 4954 | 5123 | 60 |
| 61 | 9672 | 9626 | 9581 | 5 | 94 | 9444 | 398 | 9352 | 9306 | 58.9261 | $15 \cdot 6165$ | 6337 | 6508 | 668 | 685 | 7022 | 719 | 7365 | 7537 |  | 61 |
| 62 | 9338 | 9292 | 9246 |  | 9153 | 9107 | 9060 | 9014 | 8967 | 59．8921 | 15 ＇872 | 8899 | 9074 | 9248 | 942 | 9597 | 977 | 99 | 119 | 29 | 62 |
| 63 | 9005 | 8958 | 8911 | 8864 | 8817 | 8770 | 8723 | 8675 | 8628 | $60 \cdot 8581$ | 16.1285 | 1462 | 1639 | 1817 | 1994 | 2171 | 2348 | 2525 | 2702 | 287 | 63 |
| 64 | 8672 | 8624 | 8576 | 85 | 8481 | 8433 | 8385 | 8337 | 8289 | 61.8241 | 16.3845 | 4025 | 4205 | 4385 | 4565 | 4745 | 492 | 5105 | 5284 | 546 | 64 |
| 65 | 8338 | 8290 | 42 | 8193 | 144 | 8096 | 047 | 7998 | 50 | 62＇7901 | 16.6405 | 6588 | 6771 | 6954 |  | 731 | 750 | 705 |  | 805 | 65 |
| 66 | 8005 | 7956 | 7907 | 7858 | 7808 | 9 | 7709 | 7660 | 7610 | 63.7561 | 16.8 | 9151 | 9337 | 9522 | 97 | 9893 | 107 | 026 | 0450 | 063 | 66 |
| 67 | 7672 | 7622 | 7572 | 7522 | 7472 | 7422 | 7372 | 732 | 727 | 64.7221 | 17：152 | 1714 | 1902 | 20 | 2279 | 2467 | 2656 | 28 | 3032 | 32 | 67 |
| 68 | 7339 |  |  | ， |  |  | ， | 6983 | 6932 | 65．6881 | 17．4086 | 4277 | 4468 | 4659 | 4850 | 5041 | 523 | 5424 | 615 |  | 68 |
| 69 | 7005 | 6954 | 6903 | 6851 | 6800 | 6748 | 6696 | 6644 | 6593 | $66^{\circ} 6541$ | 17•6646 | 6840 | 7034 | 7228 | 7422 | 7616 | 7810 | 8003 | 8197 | 839 | 69 |
| 70 | 6672 | 6620 | 6568 | 6516 | 6463 | 6411 | 6358 | 6306 | 6253 | 67．6201 | 17．9206 | 9403 | 959 | 9796 | 9993 | －190 | 038 | 058 | 0780 | 097 | 70 |
| 71 | 633 | 6286 | 6233 | 6180 | 6127 | 6074 | 6021 | 5967 | 5914 | 68.5861 | $18^{1766}$ | 1965 | 2165 | 2365 | 2564 | 2764 | 2963 | 3163 | 3362 | 3562 | 71 |
| 72 | 6006 | 5952 |  | 5845 | 57 | 5737 | 5683 | 5629 | 5575 | 69.5521 | 18.4326 | 4528 | 4731 | 4933 | 5136 | 5338 | 5540 | 5743 | 5945 |  | 72 |
| 73 | 5672 | 5618 | 5564 | 5509 | 5455 | 5400 | 5345 | 5290 | 5236 | 70.5181 | 18.6886 | 7091 | 7296 | 7502 | 7707 | 7912 | 8117 | 8322 | 8528 | 8733 | 73 |
| 74 | 5339 | 5284 |  | 5174 | 5118 | 5063 | 5007 | 4952 | 4896 | 71.4841 | 18.944 | 9654 | 9862 | －070 | 0278 | 0486 | 069 | 0902 | 1110 | 131 | 74 |
| 75 | 5006 | 4950 | 4894 | 4838 | 4782 | 4726 | 4670 | 4613 | 4557 | 72．4501 | 19.200 | 2217 | 2428 | 263 | 2850 | 3060 | 327 | 3482 | 369 | 390 | 75 |
| 76 | 4673 | 4616 | 4559 | 4503 | 4446 | 4389 | 4332 | 4275 | 4218 | 73：4161 | 19.4566 | 4780 | 4994 | 5207 | 5421 | 5635 | 5848 | 6062 | 6275 | 648 | 76 |
| 77 | 4339 | 4282 | 4225 | 4167 | 4110 | 4052 | 3994 | 3937 | 3879 | 74．3821 | 19.7126 | 7343 | 7559 | 7776 | 7992 | 8209 | 842 | 8642 | 8858 | 907 | 77 |
| 78 | 4006 | 3948 | 5 | 仡 | 3773 | 3715 | 3657 | 3598 | 3539 | 75．3481 | 19.9686 | 9906 | ＋125 | 0344 | 0564 | 0783 | 100 | 122 | 1440 | 166 | 78 |
| 79 | 3673 | 3614 | 3555 | 3496 | 3437 | 3378 | 3319 | 3260 | 3200 | 76.3141 | 20.2246 | 2469 | 2691 | 2913 | 3135 | 3357 | 3579 | 3801 | 4023 | 4245 | 79 |
| 80 | 3340 | ， | 20 | 3161 | 3101 | 3041 | 2981 | 2921 | 2861 | 77.2801 | 20.4807 | 5032 | 5256 | 548 | 5706 | 593 | 615 | 6381 | 6606 | 6830 | 80 |
| 81 | 3006 |  | 2886 | 2825 | 2765 | 2704 | 2643 | 2583 | 2522 | 78.2461 | 20.7367 | 7594 | 7822 | 8050 | 8278 | 8505 | 1310 | 8961 | 9178 |  | 81 |
| 82 | 2673 | 2612 | 2551 | 2490 | 2428 | 23 | 23 | 220 |  | 79.2121 | 20.9927 | ＋157 | 038 | 061 | 0849 | 1079 | 仡 | 1540 | 1871 | 200 |  |
| 83 | 2340 | 2278 | 2216 | 2154 | 2092 | 2030 | 1968 | 1906 | 1843 | 80.1781 | $21 \cdot 2487$ | 2720 | 2954 | 3187 | 3420 | 3654 | 388 | 4120 | 4353 | 4587 | 83 |
| 84 | 2007 | 1944 | 1881 | 1819 | 1756 | 1693 | 1630 | 1567 | 1504 | $81 \cdot 1441$ | $21 \cdot 5047$ | 5283 | 5519 | 5755 | 5992 | 6228 | 6464 | 6700 | 6936 | 717 | 8 |
| 85 | 1673 | 1610 | 1547 | 1483 | 1420 | 1356 | 1292 | 1229 | 1165 | $82 \cdot 1101$ | 217607 | 7846 | 808 | 8324 | 8563 | 8802 | 904 | 928 | 9518 | 975 | 85 |
| 86 | 1340 | 1276 | 1212 | 1148 | 1083 | 1019 | 0955 | 0890 | 0826 | 83．0761 | 22.0167 | 0409 | 0651 | 0892 | 1134 | 1376 | 1618 | 1859 | 2101 | 2343 | 86 |
| 87 | 1007 | 0942 | 0877 | 0812 | 0747 | 0682 | 0617 | 0552 | 0486 | 84.0421 | 22.2727 | 2972 | 3216 | 3461 | 3706 | 3950 | 419 | 4439 | 4688 | 492 | 87 |
| 88 | 0674 | 0608 | 0542 | 0477 | 0411 | 0345 | 0279 | 0213 | 0147 | 85.0081 | 22.5287 | 5535 | 5782 | 6029 | 6277 | 6524 | 67 | 年19 | 7266 | 751 | 8 |
| 89 | 0340 | 0274 | 0208 | 0141 | 0075 | －008 | 9941 | 9875 | 9808 | 85.9741 | $22 \cdot 7847$ | 8098 | 8348 | 8598 | 8848 | 9098 | 9349 | 9599 | 9849 | －09 | 89 |
| 90 | －007 | 9940 | 9873 | 9806 | 9738 | 1081 | 9604 | 9536 | 9469 | 86.9401 | 23.0407 | 066 | 0913 | 116 | 1420 | 1673 | 192 | 217 | 243 | 源 | 90 |
| 91 | 9674 | 9606 | 9538 | 9470 | 9402 | 9334 | 9266 | 9198 | 129 | 87＇9061 | 23.2967 | 322 | 3479 | 3735 | 3991 | 4247 | 4502 | 4758 | 5014 | 27 | 91 |
| 92 | 9341 | 9272 | 9203 | 9135 | 9066 | 8997 | 8928 | 8859 | 8790 | 88.8721 | 23.5528 | 5786 | 6045 | 6304 | 6562 | 6821 | 7079 | 7338 | 7596 | 7855 | 9 |
| 93 | 9007 | 898 | 8869 | 8799 | 8730 | 8660 | 8590 | 8521 | 8451 | 89.8381 | $23 \cdot 8088$ | 8349 | 8611 | 8872 | 9134 | 9395 | 9656 | 9918 | －179 | 0440 | 93 |
| 94 | 8674 | 8604 | 8534 | 846 | 8394 | 8323 | 8253 | 8182 | 8112 | $90 \cdot 8041$ | 24.0648 | 0912 | 1176 | 1441 | 1705 | 1969 | 2233 | 2497 | 2762 | 3026 | 94 |
| 95 | 8341 | 8270 | 8199 | 8128 | 8057 | 7986 | 7915 | 7844 | 7772 | $91 \cdot 7701$ | $24 \cdot 3208$ | 3475 | 3742 | 4009 | 4276 | 4543 | 4810 | 5077 | 5344 | 5611 | 95 |
| 96 | 8008 | 7936 | 7864 | 7793 | 7321 | 7649 | 7577 | 7505 | 7433 | 92＇7361 | 24.5768 | 6038 | 6308 | 6578 | 6847 | 7117 | 7387 | 7657 | 7927 | 8197 | 96 |
| 97 | 767 | 76 | 7530 | 7457 | 7385 | 7312 | 7240 | 7167 | 7094 | 93.7021 | 24：8328 | 8601 | 8873 | 9146 | 9419 | 9691 | 996 | ＋237 | 0509 | 0782 | 97 |
| 98 | 7341 | 7268 | 7195 | 7122 | 7049 | 6975 | 6902 | 6828 | 6755 | 94．6681 | $25 \cdot 0888$ | 1164 | 1439 | 1715 | 1990 | 2266 | 2541 | 2816 | 3092 | 3367 | 98 |
|  | 7008 | 6934 | 6850 | 6786 | 6376 | 6638 | 6564 | 6490 | 6415 | $95 \cdot 6341$ | $25 \cdot 3448$ | 3727 | 4005 | 4283 | 4561 | 4840 | 5118 | 5396 | 5674 | 5953 | 99 |
| 100 | 6675 | 6600 | 6526 | 6451 | 6376 | 6301 | 6226 | 6151 | 6076 | 96．6001 | $25 \cdot 6008$ | 6289 | 6571 | 6852 | 7133 | 7414 | 7695 | 7976 | 8257 | 8538 | 100 |
|  | $10^{\circ}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ | $1^{\prime}$ | $10^{\prime}$ | 9 | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ |  |  |
| 75 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $5^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.

| $15^{\circ}$ | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $15^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $3{ }^{\prime}$ | $34^{\prime}$ | 35' | 36 | 37 | $38^{\prime}$ | 39 | $30^{\prime}$ | 31 | $32^{\prime}$ | $33^{\prime}$ | 34 | 35' | $36^{\prime}$ | $37^{\prime}$ | $38^{\prime}$ | 39 |  |
|  | 9636 | 9636 | 9635 | 96 | 9633 | 96 | 96 | 9631 | 96 | 9629 | 2672 | 267 | 2678 | 2681 | 26 | 26 | 2689 | 2692 | 2695 | 98 | , |
| 2 | 9273 | 9271 | 9269 | 926 | 9266 | 92 | 9263 | 9262 | 926 | 1.9259 | 53 | 5350 | 5356 | 5362 | 5367 | 5373 | 5378 | 5384 | 5390 | 53 | 2 |
| 3 | 8909 | 8907 | 8904 | 8902 | 8900 | 8897 | 8895 | 8893 | 8890 | 2.8888 | 8017 | 8026 | 8034 | 8042 | 8051 | 8059 | 8068 | 8076 | 8084 | 8093 | 3 |
| 4 | 8545 | 8542 | 8539 | 8536 | 8533 | 8530 | 8527 | 8523 | 8520 | 3.8517 | 1.0690 | 070 | 0712 | 0723 | 0734 | 0746 | 0757 | 0768 | 0779 | 079 | 4 |
| 5 | 8182 | 8178 | 8174 | 8170 | 8166 | 8162 | 8158 | 8154 | 8150 | 4.8146 | $1 \cdot 3362$ | 3376 | 3390 | 3404 | 3418 | 3432 | 3446 | 3460 | 3474 | 348 |  |
| 6 | 7818 | 7813 | 7808 | 7804 | 7799 | 7794 | 7790 | 7785 | 7780 | 57776 | 34 | 6051 | 606 | \|6085 | 6102 | 6118 | 6135 | 6152 | 6169 | 6186 |  |
| 7 | 7454 | 7449 | 7443 | 7438 | 7432 | 7427 | 7421 | 7416 | 7410 | 6.7405 | 1.870 | 87 | 8746 | 8766 | 8785 | 88 | 8824 | 8844 | 8864 | 8883 |  |
| 8 | 7090 | 7084 | 7078 | 7072 | 7066 | 7059 | 7053 | 7047 | 7040 | $7 \cdot 7034$ | $2 \cdot 1379$ | 1401 | 1424 | 1446 | 1469 | 1491 | 1514 | 1536 | 1558 | 158 |  |
| 9 | 6727 | 6720 | 6713 | 6706 | 6699 | 6692 | 6685 | 6678 | 6671 | 8.6663 | $2 \cdot 4051$ | 4077 | 4102 | 4127 | 4152 | 4178 | 4203 | 4228 | 4253 | 427 |  |
| 10 | 6363 | 6355 | 6347 | 6340 | 332 | 6324 | 6316 | 6308 | 6301 | 9.6293 | $2 \cdot 6724$ | 6752 | 6780 | 6808 | 6836 | 6864 | 6892 | 6920 | 6948 | 697 | 10 |
| 11 | 5999 | 599 | 59 | 597 | 5965 | 595 | 594 | 593 | \|5931 | 10.592 | 2.9396 | 942 | 9458 | 948 | 95 | 9550 | 95 | 96 | 9643 | 9674 | 11 |
| 12 | 5636 | 5626 | 561 | 56 | 5598 | 55 | 5580 | 5570 | 5561 | 11.555 | 3.2069 | 2102 | 2136 | 2170 | 2203 | 223 | 2270 | 2304 | 2338 | 237 | 12 |
| 13 | 5272 | 5262 | 5252 | 5242 | 5231 | 5221 | 5211 | 5201 | 5191 | 12.5181 | 3.4741 | 477 | 4814 | 4850 | 4887 | 4923 | 4960 | 4996 | 5032 | 506 | 13 |
| 14 | 4908 | 4897 | 4886 | 4876 | 4865 | 4854 | 4843 | 4832 | 4821 | 13.4810 | 3.7413 | 745 | 7492 | 7531 | 7570 | 761 | 7649 | 7688 | 7727 | 776 | 14 |
| 15 | 4545 | 4533 | 4521 | 4510 | 4498 | 4486 | 4474 | 4463 | 4451 | 14.4439 | 4.0086 | 0128 | 0170 | 0212 | 0254 | 0296 | 0338 | 0380 | 0422 | 0464 | 15 |
| 16 | 4181 | 4168 | 4156 | 414 | 4131 | 4119 | 41 | 40 | 4081 | $15 \cdot 406$ | 4.2758 | 28 | 2848 | 28 | 29 | 2982 | 30 | 130 | 3117 | 3162 | 16 |
| 17 | 381 | 3804 | 379 | 377 | 3764 | 3751 | 3738 | 372 | 371 | $16 \cdot 3698$ | 4.5431 | 547 | 5526 | 5573 | 56 | 5669 | 5716 | 5764 | 12 | 5859 | 17 |
| 18 | 3453 | 3439 | 3425 | 3411 | 3397 | 3383 | 3369 | 3355 | 3341 | 17.3327 | 4.8103 | 815 | 8204 | 8254 | 8305 | 83 | 8406 | 8456 | 8506 | 85 | 18 |
| 19 | 309 | 3075 |  | 3045 | 3031 | 3016 | 3001 | 298 | 2971 | 18.2956 | 5.0775 | 082 | 0882 | 0935 | 0988 | 1042 | 1095 | 1148 | 1201 | 1254 | 19 |
| 20 | 2726 | 2711 | 2695 | 2679 | 2664 | 2648 | 2633 | 2617 | 2601 | 19.2586 | 5.3448 | 3504 | 3560 | 3616 | 3672 | 372 | 78 | 40 | 896 | 3952 | 20 |
| 21 | 2362 | 2346 | 233 | 23 | 22 | 2281 | 22 | 2248 | 2231 | 20.2215 | 5.6120 | 61 | 62 | 62 | 635 | 6414 | 64 | 65 | 65 | 6650 | 21 |
| 22 | 1999 | 1982 | 1964 | 1947 | 1930 | 1913 | 189 | 18 | 1861 | 21.1844 | 5.8792 | 885 | 8916 | 8977 | 903 | 91 | 9162 | 9224 | 928 | 93 | 22 |
| 23 | 1635 | 1617 | 1599 | 1581 | 1563 | 1545 | 1527 | 1509 | 149 | 22.1473 | 6.1465 | 152 | 1594 | 1658 | 1723 | 178 | 1852 | 1916 | 1980 | 2045 | 23 |
| 24 | 1271 | 1253 | 1234 | 1215 | 1197 | 1178 | 1159 | 1140 | 1121 | $23^{1 / 103}$ | 6.4137 | 42 | 4272 | 4339 | 4406 | 447 | 454 | 4608 | 4675 | 4742 | 24 |
| 25 | 09 | 0888 | 0869 | 0849 | 0830 | 0810 | 0791 | 0771 | 0752 | 24.0732 | 6.6810 | 6880 | 6950 | 7020 | 7090 | 7160 | 7230 | 7300 | 7370 | 744 | 25 |
| 26 | 0544 | 0524 | 0503 | 048 | 04 | 04 | 0422 | 0402 | 0382 | 25.036 | 6.9482 | 95 | 962 | 97 | 977 | 98 | 99 | 99 | -065 | 0138 | 26 |
| 27 | 0180 | 0159 | 0138 | 0117 | 0096 | 0075 | 0054 | 0033 | -012 | 25.9990 | $7 \cdot 21$ | 223 | 2306 | 2381 | 2457 | 25 | 2608 | 2684 | 2760 |  | 27 |
| 28 | 9817 | 9795 | 9773 | 9751 | 9729 | 9707 | 9686 | 9664 | 9642 | 26.9620 | $7 \times 4827$ | 490 | 4984 | 5062 | 5141 | 521 | 5298 | 5376 | 5454 | 55 | 28 |
| 29 | 9453 | 9430 | 9408 | 9385 | 9362 | 9340 | 9317 | 9294 | 9272 | 27 '9249 |  | 758 | 7662 | 7743 | 7824 | 79 | 7987 | 8068 | 8149 | 823 | 29 |
| 30 | 9089 | 9066 | 9042 | 9019 | 8996 | 3972 | 8949 | 8925 | 8902 | 28.8878 | 8.0172 | 0256 | 0340 | 0424 | 0508 | 059 | 067 | 0760 | 0844 | 092 | 30 |
| 31 | 872 | 8701 | 867 | 8653 | 86 | 3605 | 8580 | 8556 | 8532 | 29 | 44 | 2931 | 301 | 31 | 319 | 32 | 3365 | 3452 | 39 | 3626 | 31 |
| 32 | 8362 | 8337 | 8312 | 828 | 8262 | 8237 | 8212 | 8187 | 8162 | 30.8137 | $8 \cdot 5516$ | 560 | 5696 | 5785 | 587 | 59 | 605 | 6144 | 6234 | 63 | 32 |
| 33 | 7998 | 7972 | 7947 | 7921 | 7895 | 7869 | 7844 | 7818 | 7792 | 31776 | 8.8189 | 828 | 8374 | 846 | 8559 | 865 | 8744 | 8836 | 8928 | 9021 | 33 |
| 34 | 7634 | 7608 | 75 | 75 | 7528 | 7502 | 7475 | 7449 | 74 | 32.7395 | 0861 | 095 | 1052 | 11 | 1242 | 133 | 1433 | 1528 | 162 | 17 | 34 |
| 35 | 72 | 7243 | 7216 | 7189 | 7152 | 7134 | 7107 | 7080 | 7052 | $33 \cdot 7025$ | 33 | 363 | 3730 | 3828 | 3926 | 402 | 41 | 4220 | 4318 | 4416 | 35 |
| 36 | 6907 | 6879 | 6851 | 6823 | 6795 | 6767 | 739 | 6710 | 668 | 4.6 | 9.6206 | 6307 | 64 | 6509 | 6609 | 6710 | 6811 | 69 | 7013 | 7114 | 36 |
| 37 | 6543 | 6514 | 6486 | 6457 | 6428 | 6399 | 6370 | 6341 | 6312 | 35.6283 | 9.8878 | 898 | 9086 | 9189 | 9293 | 939 | 9500 | 9604 | 9708 |  | 37 |
| 38 | 6180 | 6150 | 6120 | 609 | 6061 | 6032 | 6002 | 5972 | 5942 | 36-5912 | 10.1551 | 1657 | 1764 | 1870 | 1977 | 208 | 2190 | 2296 | 240 | 25 | 38 |
| 39 | 5816 | 5786 | 5755 | 5725 | 5694 | 5664 | 5633 | 5603 | 5572 | 37-5542 | 10.4223 | 4332 | 4442 | 4551 | 4660 | 4769 | 487 | 4988 | 5097 | 520 | 39 |
| 40 | 5452 | 5421 | 5390 | 5359 | 5328 | 5296 | 5265 | 5234 | 5202 | 38.5171 | 10.6895 | 7007 | 7120 | 7232 | 7344 | 7456 | 756 | 7680 | 7792 | 200 | 40 |
| 41 | 508 | 5057 | 5025 | 4993 | 4961 | 4929 | 4897 | 4865 | 4832 | 30.4800 | 10.9568 | 9683 | 9798 | 9912 | ${ }^{+027}$ | 0142 | 0257 | 0372 | 0487 | 0602 | 41 |
| 42 | 4725 | 4692 | 4659 | 46 | 4594 | 4561 | 4528 | 4495 | 4463 | 40.4430 | 11.2240 | 2358 | 2476 | 2593 | 2711 | 282 | 29 | 3064 | 318 | 32 | 42 |
| 43 | 4361 | 4328 | 4294 | 426 | 4227 | 4194 | 4160 | 4126 | 4093 | 414059 | 11.4913 | 5033 | 5154 | 5274 | 5395 | 551 | 563 | 5756 | 587 | 59 | 43 |
| 44 | 3997 | 3963 | 3929 | 3895 | 3860 | 3826 | 3792 | 3757 | 3723 | $42 \cdot 3688$ | 11.7585 | 770 | 7832 | 7955 | 8078 | 820 | 832 | 8448 | 857 | 86 | 44 |
| 45 | 3634 | 35 | 3564 | 3529 | 3494 | 3458 | 3423 | 88 | 3353 | 43.3317 | 12.0257 | 0383 | 0510 | 0636 | 76 | 088 | 10 | 1140 | 1266 | 1392 | 45 |
| 46 | 3270 | 3234 | 98 | 3163 | 3127 | 3091 | 555 | 3019 | 298 | 44-2947 | 12. | 305 | 3187 | 331 | 3445 | 3574 | 3703 | 3832 |  | 4090 | 46 |
| 47 | 2906 | 2870 | 2833 | 279 | 2760 | 272 | 2686 | 2650 | 261 | 45.2576 | 12.5602 | 573 | 5865 | 59 | 6129 | 626 | 6392 | 6524 | 6656 | 678 | 47 |
| 48 | 2543 | 2505 | 2468 | 2431 | 2393 | 2356 | 2318 | 2280 | 2243 | 46.2205 | 12.8274 | 8409 | 8543 | 8678 | 8813 | 894 | 9082 | 9216 | 9350 | 948 | 48 |
| 49 | 2179 | 2141 | 2103 | 2064 | 2026 | 1988 | 1950 | 1911 | 1873 | 47-1834 | 13.0947 | 1084 | 1221 | 1359 | 1496 | 1633 | 177 | 1908 | 2045 | 218 | 49 |
| 50 | 1815 | 1776 | 1737 | 1698 | 1659 | 1620 | 1581 | 1542 | 1503 | 48.1464 | 13:3619 | 3759 | 3899 | 4040 | 4180 | 4320 | 446 | 4600 | 474 | 488 | 50 |
| 51 | 14 | 1412 | 13 | 1332 | 1293 | 1253 | 12 | 1173 | 1133 | 49 | 13 | 64 | 657 | 6720 | 686 | 700 | 7149 | 7292 | 7435 | 757 | 51 |
| 52 | 1088 | 1047 | 10 | 096 | 0926 | 0885 | 0845 | 0804 | 0763 | 50.0722 | 13.8964 | 9110 | 9255 | 9401 | 9547 | 969 | 983 | 9984 | -130 | 027 | 52 |
| 53 | 0724 | 0683 | 0642 | 0600 | 0559 | 0518 | 0476 | 0435 | 0393 | 57.0352 | 14.1636 | 1785 | 1933 | 2082 | 2230 | 237 | 2527 | 2676 | 2824 | 2973 | 53 |
| 54 | 0360 | 0318 | 0276 | 0234 | 0192 | 0150 | 0108 | 0066 | -023 | 51.9981 | 14'4309. | 4460 | 4611 | 4763 | 4914 | 506 | 5217 | 5368 | 5519 | 567 | 54 |
| 55 | 999 | 99 | 9911 | 9868 | 9825 | 9782 | 9739 | 9696 | 9653 | 52.9610 | $14 \cdot 6981$ | 13 | 289 | 7444 | 59 | 775 | 90 | 8060 | 8214 | 836 | 55 |
| 56 | 9633 | 9590 | 9546 | 502 | 9459 | 15 | 9371 | 9327 | 9283 | 53.9239 | 14.9654 | 9810 | 9967 | +1 | 028 | 043 | 05 | 0752 | 0909 |  | 56 |
| 57 | 926 | 92 |  |  | 90 | 9047 | 9003 | 895 | 8913 | 54.8869 | $15 \cdot 2326$ | 248 | 2645 | 28 | 2965 | 312 | 3284 | 3444 | 3604 | 3763 | 57 |
| 58 | 890 | 88 | 8815 | 8770 | 87 | 8680 | 8634 | 8589 | 8543 | 55.8498 | 15.4998 | 5161 | 5323 | 5486 | 5648 | 581 | 5973 | 6136 | 6298 | 6461 | 58 |
| 59 | 8542 | 8496 | 8450 | 8404 | 8358 | 8312 | 8266 | 8220 | 8174 | 56.8127 | 15.7671 | 7836 | 8001 | 8167 | 8332 | 8497 | 8663 | 8828 | 8993 | 91 | 59 |
| 60 | 8178 | 8132 | 8085 | 8038 | 7991 | 7944 | 7898 | 7851 | 7804 | $57 \cdot 7757$ | 16.0343 | 051 | 067 | 0848 | 1016 | 1184 | 1352 | 1520 | 1688 | 1856 | 60 |
| 61 | 7815 | 7767 | ${ }_{7320}$ | 767 | 7625 | 7209 | 7529 | 7481 | 7434 | 58.7386 | 16.3015 | 3186 | 3357 | 3528 |  | 385 | 4041 | 4212 | 4383 | 455 | 61 |
| 62 | 7451 | 7403 |  |  | 7258 | 7209 | 7161 | 7112 | 7064 | 59.7015 | 16.5688 | 5862 | 6035 | 6209 | 6383 | 655 | 6730 |  | 7078 | 72s | 62 |
| 63 | 7087 | 7038 | 6989 | 6940 | 6891 | 6842 | 6792 | 6743 | 6694 | 60.6644 | 16.8360 | 8537 | 8713 | 8890 | P066 | 9243 | 9419 | 9596 | 9772 | 99 | 63 |
| 64 | 6724 | 6674 | 6624 | 657 | 6524 | 6474 | 6424 | 6374 | 6324 | 61.6274 | 17•1033 | 1212 | 1391 | 1571 | 1750 | 192 | 2109 | 2288 | 2467 | 26 | 64 |
| 65 | 6360 | 6309 | 6259 | 6208 | 6157 | 6107 | 56 | 6005 | 5954 | $62 \cdot 5903$ | $17 \cdot 3705$ | 388 | 406 | 425 | 443 | 461 | 4798 | 4980 | 516 |  | 65 |
| 66 | 5996 | 5945 | 93 | 5842 | 5790 | 5739 | 5687 | 5636 | 5584 | 63>5532 | 17'637? | 6562 | 6747 | 6932 | 711 | 7302 | 748 | 7672 | 785 | 304 | 66 |
| 67 | 5632 | 55 | 5528 | 54 | 5424 | 5371 | 5319 | 5266 | 5214 | 64.5161 | 17.9050 | 923 | 9425 | 9613 | 9801 | 92 | -176 | 0364 | 0552 | 073 | 67 |
| 68 | 5269 | 5216 |  | 5110 | 5057 | 5004 | 4951 | 4897 | 4844 | $65 \cdot 4791$ | $18 \cdot 1722$ | 1913 | 2103 | 2294 | 2484 | 2675 | 2865 | 3056 | 3246 | 437 | 68 |
| 69 | 4905 | 4851 | 4798 | 4744 | 4690 | 4636 | 4582 | 4528 | 4474 | 66.4420 | 18.4394 | 4588 | 4781 | 4975 | 5168 | 5361 | 5555 | 5748 | 5941 | 6135 | 69 |
| 70 | 4541 | 4487 | 4432 | 4378 | 4323 | 4269 | 4214 | 4159 | 4104 | 67-4049 | $18 \cdot 7067$ | 7263 | 7459 | 7655 | 7852 | 2018 | 824 | ¢ | 863 | 8832 |  |
| 71 | 4178 | 4122 | 4067 | 4012 | 3956 | 3901 | 3845 | 3790 | 3734 | 68.3679 | 18.9739 | 9938 | -137 | 0336 | 0535 | 0734 | 0933 | 1732 | 1331 | 153 | 71 |
| 72 | 3814 | 3758 | 3702 | 3646 | 3590 | 3533 | 3477 | 3421 | 3364 | 69.3308 | 19.2412 | 2613 | 2815 | 3017 | 3219 | 3421 | 3622 | 3824 | 4026 | 422 | 72 |
| 73 | 3450 | 3393 | 3337 | 3280 | 3223 | 3166 | 3109 | 3052 | 2994 | 70.2937 | 19.5084 | 5289 | 5493 | 5698 | 5902 | 6107 | 6311 | 6516 | 6720 | 692 | 73 |
| 74 | 3087 |  |  | 2914 | 2856 | 2798 |  | 2682 | 2624 | 71.2566 | 19.7756 | 796 | 817 | 8379 | 8586 | 879 | 9001 | 9208 | 9415 | 962 | 74 |
| 75 | 2723 | 2665 | 2606 | 2548 | 2489 | 2¢31 | 2372 | 2313 | 2255 | 72.2196 | $20 \cdot 0429$ | 0639 | 0849 | 1059 | 1270 | 148 | 169 | 190 | 2110 | 232 | 75 |
| 76 | 2359 | 2300 | 2241 | 2182 | 2122 | 2063 | 2004 | 1944 | 1885 | 73.1825 | $20 \cdot 3101$ | 3314 | 3527 | 3740 | 12953 | 4166 | 4379 | 4592 | 4805 | 501 | 76 |
| 77 | 1995 | 1936 | 1876 | 1816 | 1756 | 1695 | 1635 | 1575 | 1515 | 74:1454 | $20 \cdot 5774$ | 5989 | 6205 | 6421 | 6637 | 6852 | 70 | 7284 | 7500 | 771 | 77 |
| 78 | 1632 | 1571 | 1510 | 1450 | 1389 | 1328 | 1267 | 1206 | 1145 | 75.1083 | 20.8446 | 8665 | 8883 | 9102 | 9320 | 953 | 975 | 9976 | 194 | 041 | 78 |
| 79 | 1268 | 1207 | 1145 | 1084 | 1022 | 0960 | 0898 | 0837 | 0775 | 76.0713 | $21 \cdot 1118$ | 1340 | 156 | 1783 | 2004 | 2225 | 2447 | 2668 | 2889 | 311 | 79 |
| 80 | 0904 | 0842 | 0780 | 0718 | 0655 | 0593 | 0530 | 0467 | 0405 | 77.0342 | $21 \cdot 3791$ | 4015 | 4239 | 4463 | 468 | 4912 | 513 | 53 | 5584 | 5808 | 80 |
| 81 | 0541 | 0478 | 0415 | 0351 | 0288 | 225 | 10162 | 0098 | . 035 | 77.9971 | 21.6463 | 6690 | 6917 | 7144 | 7371 | 7598 | 7825 | 8052 | 8279 | 8506 | 81 |
| 82 | 0177 | 0113 | -049 | 9985 | 9921 | 9857 | 9793 | 9729 | 9665 | 78.9601 | 21.9135 | 9365 | 9595 | 9825 | -055 | 0284 | 0514 | 0744 | 0974 | 120 | 82 |
| 83 | 9813 | 9749 | 9684 | 9619 | 9555 | 9490 | 9425 | 9360 | 9295 | 79.9230 | $22 \cdot 1808$ | 2041 | 2273 | 2506 | 2738 | 2971 | 3203 | 3436 | 3668 | 3901 | 83 |
| 84 | 9450 | 9384 | 9319 | 9253 | 9188 | 9122 | 9057 | 892 | 8925 | 80.8859 | 22.4480 | 4716 | 4951 | 5187 | 5422 | 5657 | 589 | 6128 | 6363 | 6599 | 84 |
| 85 | 908 | 9020 | 8954 | 8887 | 8821 | 8755 | 8688 | 8622 | 8555 | 81-8488 | $22 \cdot 7153$ | 7391 | 7629 | 7867 | 8105 | 8344 | 858 | 8820 | 9058 | 9296 | 85 |
| 86 | 8722 | 8655 | 8588 | 8521 | 8454 | 8387 | 8320 | 8252 | 8185 | 82.8118 | 22.9825 | .066 | 0307 | 0548 | 10789 | 1030 | 1271 | 1512 | 1753 | 1994 | 86 |
| 87 | 8359 | 8291 | 8223 | 8155 | 8087 | 8019 | 7951 | 7883 | 7815 | $83 \cdot 7747$ | $23^{2497}$ | 2741 | 2985 | 3229 | 3473 | 3716 | 3960 | 4204 | 4448 | 469 | 87 |
| 88 | 7995 | 7926 | 7858 | 7789 | 7721 | 7652 | 7583 | 7514 | 7445 | 84•7376 | 23.5170 | 5416 | 5663 | 5910 | 6156 | 6403 | 6649 | 6896 | 7142 | 738 | 88 |
| 89 | 7631 | 7562 | 7493 | 7423 | 7354 | 7284 | 7215 | 7145 | 7075 | $85 \cdot 7005$ | 23.7842 | 8092 | 8341 | 8590 | 8840 | 9089 | 9339 | 9588 | 9837 | -08 | 89 |
| 90 | 7267 | 7197 | 7127 | 7057 | 6987 | 6917 | 6846 | 6776 | 6705 | 86.6635 | 24.0515 | 0767 | 1019 | 1271 | 1523 | 1776 | 2028 | 228 | 2532 | 2784 | 90 |
| 91 | 6904 | 6833 | 6762 | 6691 | 6620 | 6549 | 6478 | 6407 | 6335 | 87*6264 | 24.3187 | 3442 | 3697 | 3952 | 4207 | 4462 | 477 | 4972 | 5227 |  | 91 |
| 92 | 6540 | 6468 | 6397 | 6325 | 6253 | 6182 | 6110 | 6038 | 5966 | $88^{\circ} 5893$ | 24.5859 | 6117 | 6375 | 6633 | 6891 | 7148 | 7406 | 7664 | 7922 | 8179 | 92 |
| 93 | 6176 | 6104 | 6032 | 5959 | 5887 | 5814 | 5741 | 5668 | 5596 | 89.5523 | 24.8532 | 8792 | 9053 | 9314 | 9574 | 9835 | +095 | 0356 | 0616 | 0877 | 93 |
| 94 | 5813 | 5740 | 5666 | 5593 | 5520 | 5446 | 5373 | 5299 | 5226 | 90.5152 | $25 \cdot 1204$ | 1468 | 1731 | 1994 | 2258 | 2521 | 2785 | 3048 | 3311 | 3575 | 94 |
| 95 | 5449 | 5375 | 5301 | 5227 | 5153 | 5079 | 5004 | 4930 | 4856 | 914781 | 25.3876 | 4143 | 4409 | 4675 | 4941 | 5208 | 5474 | 5740 | 6006 | 6272 | 95 |
| 96 | 5085 | 5011 | 4936 | 4861 | 4786 | 4711 | 4636 | 4561 | 4486 | 92.4410 | 25.6549 | 6818 | 7087 | 7356 | 17625 | 7894 | 8163 | 8432 | 8701 | 8970 | 96 |
| 97 | 4722 | 4646 | 4571 | 4495 | 4419 | 4344 | 4268 | 4192 | 4116 | 93'4040 | 25.9221 | 9493 | 9765 | -037 | 0309 | 0580 | 0852 | 1124 | 1396 | 166 | 97 |
| 98 | 4358 | 4282 | 4205 | 4129 | 4053 | 3976 | 3899 | 3823 | 3746 | 94•3669 | $26 \cdot 1894$ | 2168 | 2443 | 2718 | 2992 | 3267 | 3541 | 3816 | 4090 | 4365 | 98 |
|  | 3994 | 3917 | 3840 | 3763 | 686 | 3608 | 3531 | 3453 | 3376 | 95.3298 | $26 \cdot 4566$ | 4844 | 5121 | 5398 | 5676 | 5953 | 6231 | 6508 | 6785 | 7063 | 9 |
| 100 | 3631 | 3553 | 3475 | 3397 | 3319 | 3241 | 3163 | 3084 | 3006 | 96.2928 | $26 \cdot 7238$ | 7519 | 7799 | 8079 | 8359 | 8640 | 8920 | 9200 | 9480 | 9760 | 100 |
|  | $30^{\prime}$ | 29 | 28 | 27 | $26^{\prime}$ | 25 | 24 | $23^{\prime}$ | $22^{\prime}$ | $21^{\prime}$ | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | $26^{\prime}$ | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ | ${ }^{\prime}{ }^{\prime}$ | ' |  |
|  |  |  |  |  | S |  |  |  |  |  |  |  |  |  |  | SINE |  |  |  |  | $74^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $15^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $5^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 50 | 51 | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | $56^{\prime}$ | $57^{\prime}$ | $58^{\prime}$ | $59^{\prime}$ | ${ }^{5} 0^{\prime}$ | $51^{\prime}$ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | $58^{\prime}$ | 59 |  |
|  | 9621 | 9620 | 9619 | 9618 | 9617 | 9617 | 9616 | 9615 | 9614 | 9613 | 2728 | 2731 | 34 | 2737 | 2740 | 2742 | 2745 | 2748 | 1 | 2754 |  |
|  | 92 | 9240 | 9238 | 9236 | 9235 | 9233 | 9232 | 9230 | 9228 | 1.9227 | 5457 | 5462 | 5468 | 5474 | 547 | 5485 | 5490 | 5496 | 5502 | 5507 |  |
| 3 | 8862 | 8859 | 8857 | 8855 | 8852 | 88 | 88 | 8845 | 8843 | 2.8840 | 185 | 8194 | 8202 | 8210 | 82 | 82 | 8236 | 82 | 8252 | 8261 |  |
|  | 8482 | 8479 | 8476 | 8473 | 8470 | 8466 | 8463 | 8460 | 8457 | 3.8454 | 0914 | 0925 | 0936 | 0947 | 095 | 0970 | 0981 | 099 | 1003 | 101 |  |
| 5 | 8103 | 809 | 8095 | 8091 | 8087 | 8083 | 8079 | 8075 | 8071 | $4 \cdot 8067$ | $1 \cdot 3642$ | 36 | 367 | 3684 | 3698 | 3712 | 3726 | 3740 | 3754 | 376 |  |
|  | 77 | 77 | 77 | 7709 | 7704 | 77 | 7695 | 7690 | 7685 | $5 \cdot 7681$ | $1 \cdot 6370$ | 6387 | 6404 | 6421 | 6438 | 6454 | 6471 | 6488 | 6505 |  |  |
| 7 | 7344 | 7339 | 7333 | 7327 | 7322 | 7316 | 731 | 7305 | 730 | $6 \cdot 7294$ | ． 909 | 9118 | 9138 | 9158 | 917 | 91 | 9216 | 9236 | 9255 | 9275 |  |
|  | 6965 | 6958 | 6952 | 6946 | 939 | 6933 | 6927 | 6920 | 6914 | 76907 | $2 \cdot 1827$ | 1850 | 1872 | 1894 | 1917 | 193 | 1961 | 1984 | 200 | 2029 |  |
|  | 6585 | 6578 | 6571 | 6564 | 6557 | 6550 | 6542 | 6535 | 652 | $8{ }^{6} 652$ | $2 \cdot 455$ | 4581 | 4606 | 4631 | 465 | 4682 | 4707 | 4732 | 475 | 4782 |  |
| 10 | 6206 | 6198 | 6190 | 82 | 74 | 6166 | 6158 | 6150 | 6142 | 9.6134 | $2 \cdot 7284$ | 7312 | 7340 | 7368 | 739 | 7424 | 7452 | 7480 | 50 | 53 | 10 |
| 11 | 5827 | 5818 | 5809 | 58 | 5792 | 5783 | 5774 | 576 | 5756 | 10.5748 | 3.0012 | 0043 | 007 | 01 | 0136 | 0166 | 019 | 0228 | 0259 | 0289 | 11 |
| 12 | 5447 | 5438 | 5428 | 5419 | 5409 | 5399 | 5390 | 5380 | 5371 | 11.5361 | $3 \cdot 2741$ | 2774 | 2808 | 2842 | 287 | 290 | 2942 | 2976 | 300 | 3043 | 12 |
| 13 | 5068 | 505 | 5047 | 503 | 5026 | 5016 | 5006 | 4995 | 4985 | 12.4974 | 3.5469 | 5506 | 5542 | 5578 | 56 | 56 | 5687 | 572 | 5760 | 5797 | 13 |
| 14 | 4688 | 467 | 466 | 4655 | 4644 | 463 | 46 | 4610 | 4599 | $13^{\prime} 4588$ | 3.8198 | 8237 | 8276 | 8315 | 835 | 839 | 8433 | 847 | 8511 | 8550 | 14 |
| 15 | 430 | 429 | 428 | 3 | 4261 | 424 | 42 | 42 | 213 | 14. | $4 \cdot 0926$ | 0968 | 1010 | 1052 | 1094 | 1136 | 1178 | 122 | 126 | 1304 | 15 |
| 16 | 393 | 39 | 39 | 3891 | 3879 | 38 | 38 | 3840 | 3828 | 15.3815 | ． 36 | 36 | 37 | 3789 | 38 | 38 | 3923 | 13968 | 4012 |  | 16 |
| 17 | 3550 | 3537 | 352 | 351 | 349 | 3482 | 34 | 345 | 3442 | 16.3428 | $4 \cdot 63$ | 643 | 647 | 652 | 657 | 66 | 66 | 67 | 6763 |  | 17 |
| 18 | 3171 | 315 | 3142 | 3128 | 3113 | 3099 | 3085 | 3070 | 3056 | $17 \cdot 3042$ | 4.9111 | 9162 | 9212 | 926 | 93 | 936 | 9413 | 946 | 951 | 956 | 18 |
| 19 | 2791 | 277 | 2761 | 46 | 31 | 2716 | 270 | 2685 | 670 | 18.265 | 5．184 | 1893 | 1946 | 199 | 20 | 21 | 2159 | 2212 | 226 | 2318 | 19 |
| 20 | 2412 | 2396 | 2380 | 2364 | 2348 | 2332 | 2316 | 2300 | 2284 | 19.2268 | 5\％4568 | 4624 | 4680 | 4736 | 479 | 484 | 4904 | 4960 | 01 | 572 | 20 |
| 21 | 2032 | 20 | 199 | 1982 | 196 | 1949 | 1932 | 1915 | 1899 | 20 | 29 | 73 | 7414 | 7473 | 753 | 7590 | 7649 | 7708 | 7766 | 7825 | 21 |
| 22 | 1653 | 1636 | 1618 | 1601 | 1583 | 1566 | 1548 | 1530 | 1513 | $21 \cdot 1495$ | ． 0025 | 0086 | 0148 | 0209 | 027 | 033 | 039 | 045 | 05 | 057 | 22 |
| 23 | 1274 | 1255 | 123 | 1219 | 1200 | 1182 | 1164 | 1145 | 1127 | $22 \cdot 1109$ | ＇275 | 281 | 2882 | 2946 | 301 | 30 | 3139 | 320 | 326 | 3332 | 23 |
| 24 | 0894 | 0875 | 085 | 0837 | 0818 | 0799 | 0780 | 0760 | 0741 | 23.0722 | 6.5482 | 5549 | 5616 | 5683 | 575 | 58 | 5884 | 5952 | 601 | 6086 | 24 |
| 25 | 05 | 0495 | 047 | 0455 | 0435 | 0415 | 0395 | 0375 | 55 | 24．0335 | 210 | 8280 | 8350 | 8420 | 849 | 85 | 8630 | 8700 | 8770 | 8839 | 25 |
| 26 | 0135 | 0115 | 0094 | 007 | 0053 | 0032 | － | 999 | 9970 | $24 \cdot 99$ | 7.0938 | 1011 | 1084 |  | 12 |  | 13 | 418 | 1520 | 1593 | 26 |
| 27 | 9756 | 9735 | 9713 | 969 | 967 | 9649 | 962 | 9606 | 9584 | 25.95 | $7 \cdot 3$ | 374 | 38 | 38 | 396 | 40 | 412 | 419 |  | 434 | 27 |
| 28 | 9377 | 9354 | 93 | 93 | 9288 | 9265 | 9243 | 9221 | 9198 | 26.9176 | 7.63 | 647 | 6552 | 6630 | 67 | 67 | 686 | 694 | 70 | 710 | 28 |
| 29 | 8997 | 8974 | 8951 |  | 890 | 8882 | 8859 | 8836 | 8812 | $27 \cdot 8789$ | 7.9124 | 9205 | 9286 | 9367 | 944 | 95 | 9610 | 969 | 9773 | 985 | 29 |
| 30 | 8618 | 8594 | 8570 | 8546 | 8522 | 8498 | 475 | 8451 | 8427 | 28.8403 | 8.185 | 1936 | 2020 | 2104 | 218 | 227 | 2356 | 244 | 52 | 2607 | 30 |
| 31 | 823 | 82 | 818 | 81 | 814 | 8115 | 8090 | 8066 | 8041 | 29.801 | 84580 | 46 | 47 | 48 | 4927 | 501 | 5101 | 5188 | 5274 | 5361 | 31 |
| 32 | 7859 | 7834 | 7808 | 7783 | 7757 | 7732 | 77 | 7681 | 7655 | $30 \cdot 762$ | 87 | 7398 | 748 | 757 | 766 | 77 | 78 | 793 | 802 | 81 | 32 |
| 33 | 7480 | 7453 | 7427 | 7401 | 7375 | 73 | 7322 | 7296 | 72 | 31．7243 | 9.003 | 013 | 02 | 0314 | 040 | 04 | 059 | 068 | 077 | 8868 | 33 |
| 34 | 7100 | 7073 | 7046 | 7019 | 6992 | 69 | 6938 | 691 | 68 | 32.6856 | 9.2766 | 286 | 29 | 3051 | 314 | 32 | 33 | 343 | 35 | 362 | 34 |
| 35 | 6721 | 6693 | 6665 | 6637 | 6609 | 6582 | 6554 | 6526 | 6498 | 470 | 9.5494 | 559 | 5690 | 5788 | 5886 | 598 | 6082 | 6179 | 627 | 63 | 35 |
| 36 | 6341 | 6313 | 6284 | 62 | 622 | 6198 | 6169 | 61 | 6112 | 83 | $9 \cdot$ | 8323 | 8424 | 8525 | 8625 | 87 | 8827 | 8927 | 9028 | 9129 | 36 |
| 37 | 5962 | 593 | 5903 | 587 | 584 | 5815 | 578 | 57 | 5726 | 35.5696 | 10.095 | 10 | 11 | 126 | 136 | 146 | 157 | 167 | 177 | 188 | 37 |
| 38 | 5583 | 5552 | 55 | 5492 | 5462 | 5431 | 5401 | 5371 | 5340 | 36.5310 | 10.367 | 37 | 389 | 399 | 410 | 42 | 43 | 442 | 45 | 463 | 38 |
| 39 | 5203 | 5172 | 5141 | 51 | 5079 | 5048 | 5017 | 4986 | 4955 | 37－4923 | 10.6408 | 6517 | 6626 | 6735 | 68 | 695 | 706 | 717 | 7280 | 738 | 39 |
| 40 | 4824 | 4792 | 4760 | 4728 | 4697 | 4665 | 4633 | 4601 | 4569 | 38.4537 | 10.9136 | 9248 | 9360 | 9472 | 958 | 969 | 8 | 991 | 1031 | 0143 | 40 |
| 41 | 444 | 441 | 437 | 4347 | 431 | 4281 | 4249 | 421 | 418 | 39.4150 | 11．1864 | 19 | 20 | 22 | 2323 | 24 | 25 | 266 | 278 |  | 41 |
| 42 | 4065 | 4032 | 399 | 396 | 3931 | 3898 | 3864 | 383 | 379 | 40.3764 | 11.4593 | 471 | 48 | 494 | 50 | 51 | 52 | 541 | 553 | 56 | 42 |
| 43 | 3686 | 3651 | 3617 | 3583 | 3549 | 3514 | 480 | 3446 | 3411 | 41.3377 | 11.732 | 744 | 756 | 768 | 780 | 79 | 80 | 816 | 82 | 8404 | 43 |
| 44 | 3306 | 3271 | 323 | 320 | 3166 | 3131 | 3096 | 306 | 3026 | 42.29 | 12.0 | 017 | 0 | 041 | 05 | 0665 | 07 | 091 | 1034 | 11 | 44 |
| 45 | 2927 | 28 | 2855 | 2819 | 2784 | 2748 | 2712 | 26 | 264 | 43．2604 | 12．2778 | 290 | 3030 | 3156 | 3282 | 34 | 35 | 365 | 378 | 39 | 45 |
| 46 | 2547 | 2511 | 2474 | 2438 | 2401 | 2364 | 2328 | 229 | 2254 | 17 | 12.550 | 5635 | 5764 | 5893 | 6021 |  | 627 | 6407 | 6536 | 6665 | 46 |
| 47 | 2168 | 2131 | 2093 | 2056 | 2018 | 1981 | 1943 | 1906 | 1868 | $45^{\circ} 1831$ | 12.82 | 83 | 8498 | 862 | 8761 | 88 | 90 | 915 | 9287 | 941 | 47 |
| 48 | 1789 | 1750 | 1712 | 1674 | 1636 | 1598 | 1559 | 1521 | 1483 | $46 \cdot 1444$ | 13.09 | 10 | 1232 | 136 | 1500 | 16 | 176 | 190 | 2037 | 217 | 48 |
| 49 | 1409 | 1370 | 1331 | 1292 | 253 | 1214 | 175 | 1136 | 1097 | 47•1057 | 13.3 | 382 | 396 | 4103 | 424 | 437 | 451 | 465 | 478 | 4925 | 49 |
| 50 | 1030 | 0990 | 0950 | 0911 | 871 | 0831 | 791 | 0751 | 0711 | 48.0671 | $13 \cdot 642$ | 656 | 670 | 6840 | 6980 | 712 | 7259 | 7399 | 7539 | 767 | 50 |
| 51 | 0650 | 0610 | 0569 | 052 | 0488 | 0447 | 0407 | 236 | 0325 | 49.0284 | 13.9148 | 929 | 9434 | 957 | 971 | 986 | －00 | 0147 | 290 | 043 | 51 |
| 52 | 0271 | 0230 | 0188 | 0147 | 0105 | 64 | ＊023 | 9981 | 939 | $49^{\prime 9} 988$ | 14.1877 | 202 | 2168 | 2313 | 245 | 260 | 275 | 289 |  | 31 | 52 |
| 53 | 9891 | 9849 | 9807 | 9765 | 9723 | 9681 | 638 | 9596 | 9554 | 50.95 | 14.460 | 4753 | 4902 | 5050 | 519 | 53 | 549 | 56 | 5791 | 59 | 53 |
| 54 | 9512 | 9469 | 9426 | 9383 | 9340 | 9297 | 9254 | 921 | 9168 | 51.9125 | 14.7 | 748 | 76 | 7787 | 793 | 80 | 8240 | 8391 | 8542 | 8693 | 54 |
| 55 | 9133 | 9089 | 9045 | 9002 | 8958 | 14 | 870 | 8826 | 8782 | 52．8738 | 15－0062 | 021 | 03 | 0524 | 0678 | 083 | 0985 | 1139 | 1293 | 1447 | 55 |
| 56 | 875 | 8709 | 8664 | 8620 | 8575 | 8530 | 8486 | 8441 | 8396 | 53.8351 | 15 | 2947 | 3104 | 3260 | 3417 | 3574 | 3730 | 3887 | 4044 |  | 56 |
| 57 | 8374 | 8329 | 8283 | 82 | 8193 | 47 | 102 | 8056 | 8010 | 54＇7965 | 15. | 5678 | 5838 | 5997 | 6157 | 63 | 64 | 6635 | 679 | 695 | 57 |
| 58 | 7994 | 7948 | 7902 | 78 | 781 | 77 |  | 767 | 7625 | 55.7578 | $15 \cdot 8247$ | 84 |  | 8734 | 889 | 90 | 92 | 9383 |  | 97 | 58 |
| 59 | 7615 | 7568 | 21 | 7474 | 7427 | 7380 | 333 | 7286 | 7239 | 56.7192 | 16．0976 | 11 | 1306 | 1471 | 1636 | 180 | 196 | 2131 | 229 | 246 | 59 |
| 60 | 7236 | 7188 | 7140 | 7093 | 045 | 6997 | 949 | 6901 | 6853 | 57－6805 | $16 \cdot 370$ | 3872 | 404 | 420 | 437 | 454 | 471 | 487 | 5047 | 521 | 60 |
| 61 | 6856 | 6808 | 6759 | 6711 | 6662 | 6614 | 6565 | 6516 | 6467 | 58：641 | 16.643 | 660 | 6774 | 6944 | 7115 | 728 | 745 | 7627 | 779 | 796 | 61 |
| 62 | 6477 | 6428 | 6378 | 632 | 6280 | 6230 | 618 | 6131 | 6082 | 59．6032 | 16.916 | 9334 | 95 | 9681 | 985 |  | 02 | 037 |  | 072 | 62 |
| 63 | 6097 | 6047 | 5997 | 594 | 5897 | 5847 | 5797 | 5746 | 5696 | 60.5645 | 17•1889 | 206 | 2242 | 2418 | 2594 | 277 | 20 | 3123 | 328 | 仿 | 6 |
| 64 | 5718 | 5667 | 5616 | 5565 | 5514 | 5463 | 5412 | 536 | 5310 | 61.5259 | $17 \cdot 4618$ | 479 | 497 | 5155 | 5334 | 5513 | 5692 | 587 | 6050 | 622 | 6 |
| 65 | 5339 | 5287 | 5235 | 5184 | 5132 | 5080 | 5028 | 4976 | 4924 | 62.4872 | 177346 | 752 | 77 | 78 | 8073 | 825 |  | 8619 | 8801 | 8983 | 65 |
|  | 495 | 49 | 4854 | 48 | 47 | 4697 | 4644 | 45 | 4538 | 63 | 18 | 025 |  |  | 081 |  |  | 1367 | 155 |  | 66 |
| 67 | 4580 | 4527 | 4473 | 4420 | 4367 | 4313 | 4260 | 4206 | 4153 | 64\％40 | 18.2803 | 2990 | 317 | 336 | 355 | 37 | 392 | 4115 | 430 | 449 | 67 |
| 68 | 4200 | 4146 | 409 | 403 | 3984 | 3930 | 3876 | 382 | 376 | 65．3712 | 18.553 | 5721 | 5912 | 6102 | 629 | 648 | 667 | 6863 | 705 | 724 | 68 |
| 69 | 3821 | 3766 | 3711 | 3656 | 3601 | 3547 | 3491 | 3 321 | 3381 | $66^{\circ} 3326$ | 18.8260 | 8453 | 8646 | 8839 | 9032 | 22 | 916 | 961 | 980 | 2750 | 69 |
| 70 | 3442 | 3386 | 3330 | 3275 | 3219 | 3163 | 3107 | 305 | 2995 | 67．2939 | 19.098 | 118 | 1380 | 157 | 177 | 196 | 216 | 235 | 2555 | 275 | 70 |
| 71 | 3062 | 3006 | 2949 | 893 | 2836 | 2780 | 2723 | 2666 | 2610 | 68.2553 | 19.3716 | 3915 | 411 | 4312 | 451 | 471 | 4908 | 5107 | 530 | 550 | 71 |
| 72 | 2683 | 2626 | 2568 | 2511 | 2454 | 2396 | 2339 | 2281 | 2224 | 69.2166 | $19 \cdot 6445$ | 6646 | 68 | 70 | 725 | 745 | 76 | 785 | 805 | 825 | 72 |
| 73 | 2303 | 2245 | 2187 | 2129 | 2071 | 2013 | 1955 | 1896 | 1838 | 70．1780 | 19.9173 | 9377 | 9582 | 9786 | 9990 | ＋192 | 039 | 0603 | 080 |  | 73 |
| 74 | 1924 | 1865 | 1806 | 1748 | 1689 | 1630 | 1571 | 1511 | 1452 | 71．1393 | 20．1902 | 210 | 23 | 2523 | 2730 | 2937 | 3144 | 3351 | 3558 | 376 | 74 |
| 75 | 1545 | 1485 | 1425 | 1366 | 1306 | 1246 | 1186 | 1126 | 1066 | 72．1006 | 20．4630 | 484 | 5050 | 526 | 5469 | 5679 | 58 | 6099 | 6309 | 65 | 75 |
| 76 | 1165 | 1105 | 1044 | 0984 | 0923 | 0863 | 0802 | 0741 | 0681 | $73^{\circ} 0620$ | 20．735 | 7571 | 7784 |  |  | 842 |  |  | ， |  | 76 |
| 77 | 0786 | 0725 | 0663 | 0602 | 0541 | 0479 | 0418 | 0356 | 0295 | 74：0233 | $21 \cdot 008$ | 0302 | 0518 | 0733 | 0949 | 1136 | 1379 | 1595 | 1810 |  | 77 |
| 78 | 0406 | 0344 | 0282 | 0220 | 0158 | 0096 | ＋034 | 9971 | 9909 | 74.9847 | $21 \cdot 2815$ | 3033 | 32 | 3470 | 3688 | 390 | 4125 | 4343 | 456 | 477 | 78 |
| 79 | －027 | 99 | 9901 | 9839 | 9776 | 9713 | 9650 | 9587 | 9523 | 75.9460 | $21 \cdot 5544$ | 5765 | 59 | 6207 | 6428 | 664 | 687 | 7091 | 7312 | 753 | 78 |
| 80 | 9648 | 9584 | 9520 | 457 | 9393 | 9329 | 9265 | 9202 | 9138 | 76.9073 | 21.8272 | 8496 | 872 | 894 | 9167 | 939 | 961 | 983 | ． 06 | 028 | 80 |
| 81 | 9268 | 9204 | 9139 | 9075 | 9010 | 8946 | 8881 | 8817 | 8752 | 77•8687 | 22•1000 | 1227 | 1454 | 1680 | 1907 | 2134 | 236 | 2587 | 281 | 304 | 81 |
| 82 | 8889 | 8824 | 8758 | 8693 | 8628 | 8563 | 8497 | 8432 | 8366 | 78.8300 | 22．3729 | 3958 | 4188 | 4417 | 4647 | 4876 | 5105 | 5335 | 5564 | 579 | 82 |
| 83 | 8509 | 8443 | 8377 | 8311 | 8245 | 8179 | 8113 | 804 | 7980 | $79 \cdot 7914$ | 22．6457 | 668 | 69 | 7154 | 7386 | 761 | 785 | 808 | 831 | 854 | 83 |
| 84 | 8130 | 8063 | 7996 | 7930 | 7863 | 7796 | 7729 | 7662 | 7594 | 80.7527 | 22.9186 | 9421 | 965 | 9891 | －126 | 036 | 059 | 083 | 106 | 130 | 84 |
| 85 | 7750 | 7683 | 15 | 7548 | 迷 | 7412 | 7345 | 27 | 7209 | $81 \cdot 7141$ | 23•1914 | 2152 | 2390 | 262 | 286 | 310 | 334 | 357 | 381 | 405 | 8 |
| 86 | 7371 | 7303 | 7234 | 7166 | 矿 | 7029 | 6960 | 6892 | 6823 | 82.6754 | 23＊464 | 4883 | 5124 | 5364 | 5605 |  | 硡 |  |  |  | 86 |
| 87 | 6992 | 6923 | 6853 | 6784 | 6715 | 6646 | 6576 | 6507 | 6437 | $83 \cdot 6367$ | 23•7371 | 7614 | 7858 | 8101 | 8345 | 8588 | 883 | 9075 | 9318 | 956 | 87 |
| 88 | 6612 | 6542 | 6472 | 6402 | 6332 | 6262 | 6192 | 6122 | 6051 | 84．5981 | 24•0099 | 0345 | 059 | 0838 | 1084 | 133 | 157 | 1823 | 2069 | 231 | 88 |
| 89 | 6233 | 6162 | 6091 | 6021 | 5950 | 5879 | 5808 | 5737 | 5665 | $85 \cdot 5594$ | 24.2828 | 3077 | 3326 | 3575 | 3824 | 4073 | 4322 | 4571 | 4820 | 506 | 89 |
| 90 | 5853 | 57 | 5710 | 5639 | 5567 | 5495 | 5424 | 5352 | 5280 | 86.5208 | 24.5556 | 5808 | 6060 | 6311 | 6563 | 6815 | 706 | 7319 | 7570 | 7822 | 90 |
| 91 | 5474 | 5402 | 5329 | 5257 | 5185 | 5112 | 5039 | 4967 | 4894 | $87 \times 4821$ | 24.8284 | 8539 | 8794 | 9048 | 9303 | 955 | 981 | ${ }^{+067}$ | 0321 | 057 | 91 |
| 92 | 5095 | 5022 | 4948 | 4875 | 4802 | 4729 | 4655 | 4582 | 4508 | 88.4434 | $25 \cdot 1013$ | 1270 | 1528 | 1785 | 2042 | 2300 | 2557 | 2815 | 3072 | 332 | 9 |
| 93 | 4715 | 4641 | 4567 | 4494 | 4419 | 4345 | 4271 | 4197 | 4122 | $89 \cdot 4048$ | $25 \cdot 3741$ | 4001 | 4262 | 4522 | 4782 | 504 | 5302 | 5563 | 5823 | － | 析 |
| 94 | 4336 | 4261 | 4186 | 4112 | 4037 | 3962 | 3887 | 3812 | 3737 | $90 \cdot 3661$ | 25.6470 | 6733 | 6996 | 7259 | 7522 | 778 | 804 | 8310 | 8573 | 8836 | 94 |
| 95 | 3956 | 3881 | 3805 | 3730 | 654 | 3579 | 503 | 3427 | 3351 | $91 \cdot 3275$ | 25.9198 | 46 | 9730 | 999 | －26 | O52 | 079 | 105 | 132 | 1590 | 95 |
| 96 | 3577 | 3501 | 3424 | 3348 | 3272 | 3195 | 3119 | 3042 | 2965 | 92288 | $26 \cdot 1926$ | 2195 | 2464 | 2732 | 3001 | 326 | 5538 | 3806 | 4075 | 4343 | 96 |
| 97 | 3198 | 3121 | 3043 | 2966 | 2889 | 2812 | 2734 | 2657 | 2579 | 93.2502 | 26－4655 | 4926 | 5198 | 5469 | 5740 | 601 | 628 | 65 | 6826 | 7097 | 97 |
| 98 | 2818 | 2740 | 266 | 2585 | 2506 | 2428 | 2350 | 2272 | 2193 | 94.2115 | $26 \cdot 7383$ | 7657 | 7932 | 8206 | 8480 | 8754 | 9028 | 9302 | 9577 | 9851 | 8 |
|  | 2439 | 2360 | 2281 | 2203 | 2124 | 2045 | 1966 | 1887 | 1808 | 95．1728 | $27 \cdot 0112$ | 0389 | 0666 | 0943 | 1220 | 1497 | 1774 | 2050 | 2327 | 2604 | 9 |
| 100 | 2059 | 980 | 901 | 1821 | 1741 | 1662 | 1582 | 1502 | 1422 | 96．1342 | $\underline{27 \cdot 2840}$ | 3120 | 3400 | 3679 | 3959 | 4239 | 4519 | 4798 | 5078 | 5358 | 100 |
|  | 10 | 19 $9^{\prime}$ | 18＇ | $17^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ | $1^{\prime}$ | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3{ }^{\prime}$ | $2^{\prime}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.

|  |  |  |  |  | Cosin |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }_{881}^{920}$ | ${ }^{9206} 88$ | ${ }^{2904} 888$ |  | 8881 |  |  |  |  |  |  | $5580$ |  |  |  | 03 |  |  |  |  |
|  |  | 8415 | 8412 |  |  |  |  |  |  |  |  |  |  | 1731 |  |  | 1204 |  |  |  |  |
|  | 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | T22 | 7221 |  |  |  |  |  |  |  |  | 9510 | ${ }_{9529}$ | S50 | 9568 | 9588 | 9608 | 9627 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $2364$ | $\begin{aligned} & 386 \\ & 185 \end{aligned}$ |  |  |  |  |  |
|  |  |  |  |  |  |  | 6939 |  | 5981 |  | 278 | 5084 | ${ }_{7899}$ | ${ }_{7}^{5134}$ |  | ${ }_{1983}^{189}$ | 801 |  |  |  |  |
|  | 17 | 564 | ${ }^{5632}$ | ${ }_{5}^{5623}$ | 5514 | 5605 | 5597 | 5588 | 5577 |  |  | ${ }^{0658}$ | 0689 | 0720 | 0750 | 781 | 0812 | ${ }^{343}$ | ${ }^{0873}$ |  |  |
|  |  |  |  |  | 5216 |  |  |  |  |  |  | 3445 | 3479 |  |  | 357 |  |  |  |  |  |
|  |  |  |  |  | ${ }_{4418}$ |  |  | ${ }_{4384}$ | ${ }_{437}^{437}$ |  |  | ${ }_{9020}^{6233}$ | ${ }^{6259}$ |  | ${ }_{9}^{634}$ | $\left.\begin{array}{\|c\|c\|c\|c\|} \hline 978 \\ 9176 \end{array} \right\rvert\,$ | $\begin{aligned} & 6414 \\ & 9215 \end{aligned}$ |  | 2938 |  |  |
|  |  | 405 | ${ }_{404}^{44}$ | 4032 |  | 4007 |  | ${ }_{3983}$ | 3371 | 143 | 41765 | 1807 | 1849 | 1891 | 1932 | 1974 | 6 | 8 | 2100 |  |  |
|  | 16 | 366 |  |  |  |  |  |  |  | $15 \cdot 35$ | 4.45 | 4594 | 1639 | 4683 | 4728 | 471 | 1817 | 882 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | O | 2075 |  |  |  |  |  |  | 1961 |  | 5:5686 | 5742 | 5798 | ${ }_{585}$ |  | 108 |  | 6278 | 133 |  |  |
|  | 1696 | 167 |  |  |  |  |  |  |  |  |  |  | 8588 |  |  |  | 23 |  | 940 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 077 |  |  |  |  | 41 | 43 |  |  |  |  | 533 |  |  |
|  | 5 |  |  | 0053 |  | 1012 |  | 997 |  |  | $6 \cdot 9$ | ${ }_{9678}$ | ${ }_{978}^{6988}$ | ${ }_{981}$ | ${ }_{988}^{709}$ | 995 | ${ }_{027} 228$ | 0987 | ${ }_{0} 1816$ |  |  |
|  | 6 | 969 | 96 | 96 |  | 9613 | 9592 |  | 9549 | 24 |  |  | 2538 | 2610 | 2683 | 2756 | 2828 | 2901 | 2973 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 5252 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | ${ }_{8367}$ |  |  |  |  |  |  |  | 1150 | 123 | 1312 | 1393 |  |  |
|  | 81 | 11 |  |  | 8039 | 8015 |  | 7966 | 7942 |  |  |  | 3697 |  | 38 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 784 | 7816 | 779 | ${ }_{676}$ | 7738 |  | 8:90988 |  |  |  |  |  |  |  |  |  |  |
|  | 4 | 652 |  | 64 | 6445 |  |  |  |  |  |  |  |  |  |  |  |  | 32 | 542 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 478 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4 | 4 | ${ }_{4}$ | 208 | 4055 | 4 | 4388 | 4395 | ${ }^{4324}$ | 2422 |  | ${ }_{1489} 8$ | ${ }_{15897}^{889}$ | 18915 | 1820 |  |  |  |  |  |  |
|  | 378 | 3754 | 372 | 3387 | ${ }^{3654}$ | 3220 | ${ }^{3587}$ | 3554 | 3520 |  | 11.4157 | 427 | 4386 | 4501 | 4615 | 4730 | 4844 |  | 073 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 312 |  |  | 3493 |  |  |
|  | 5 | 216 | 2132 |  |  | 202 | 1986 | 1949 | 1912 |  | $12 \cdot 5295$ |  | 5546 |  |  | 5923 |  | 6174 | , |  |  |
|  | ${ }^{6} 1814$ | 177 | ${ }_{1385}^{1735}$ | ${ }_{1}^{139}$ | ${ }^{1660}$ | ${ }^{1} 122$ | 1585 | ${ }^{1548}$ | 151 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 06 | 558 |  | 05 | 046 | 0.424 | 0385 | ${ }^{234}$ | 030 |  |  |  |  | 684 |  |  |  |  | 7527 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 05 |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 530 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 83 |  |  |  |  |  |  |  |  | 1108 | 1258 | 1409 | 156 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 421 | 4367 |  |  |
|  | 67875 | 81 | 776 | 77 |  | 7628 | 7582 | ${ }^{7537}$ | 7491 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 566 | 5621 | 6573 |  |  |  | 6381 | 633 | 6285 |  |  | 444 | 460 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 5981 |  | 883 | . 5834 | 6.7059 |  |  | 56 |  | 789 | 3065 |  |  |  |  |
|  |  |  |  |  |  |  | 5581 | 5531 | 548 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 503 | 498 | ${ }_{4}^{5334} 4$ | ${ }_{4883}^{528}$ | ${ }_{483}^{523}$ | 4780 | ${ }_{472}$ | 467 |  |  | ${ }_{5}^{2888}$ |  |  | ${ }_{\substack{332 \\ 6116}}$ | 3494 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | $379$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\left.\right\|_{68} ^{67}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7673 |  |  |  |  |
|  | 927 | 2655 |  | 254 | 2491 | ${ }_{2234}^{234}$ | ${ }_{2378}^{2278}$ | 2322 | 226 |  |  |  | 2504 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | , | 1074 | 1014 | 0955 |  | 0836 | 077 | 0717 | 0658 |  |  |  |  |  |  |  | 7 | 83 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | * 81 |  |  |  |  |
|  |  |  |  |  |  | ${ }_{9238}^{9638}$ | 5776 | 9514 | 9050 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{8} 89515$ | 909 |  | 8966 | 8902 | ${ }_{883} 83$ |  |  |  |  |  |  | 7613 | 783 | 8049 | 8267 |  |  |  |  |  |
|  | ${ }^{9} 8$ |  | ${ }^{3632}$ | ${ }^{8568}$ |  |  |  |  |  |  |  |  | 040 |  |  | 106 |  |  |  |  |  |
|  |  | 790 |  | 7772 |  | 7640 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 527574 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{4} 46783$ |  |  |  | 6510 | 16442 | ${ }_{633}{ }^{637}$ | ${ }_{6305}$ | ${ }^{6238}$ |  |  |  | ${ }^{435}$ |  |  |  | 2290 | 5526 |  |  |  |
|  | 5 | 63 | 6250 | 6181 |  | 6042 | 5973 |  |  |  | ${ }^{23} 68$ | 6905 |  |  |  | 785 | 3092 |  |  |  |  |
|  |  |  |  |  |  | 5643 |  | 5503 | 543 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 588539 |  |  | 5385 | ${ }^{5314}$ | 484 | 5173 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 4589 |  | 444 | 4372 | 429 | 4 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 34 |  |  |  |  |  |  |  |
|  |  | 354, | ${ }_{34}^{38}$ | 33, | 332 |  | ${ }_{\text {l }}^{1}$ | ${ }_{3026}^{3497}$ | ${ }^{3423}$ |  |  |  |  |  |  | ${ }^{6} 443$ |  |  |  |  |  |
|  | ${ }^{3} 322$ | 314 |  |  | 292 |  | 2771 | $\begin{aligned} & 3096 \\ & 2069 \\ & \hline \end{aligned}$ | 261 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5 | ${ }_{235}^{2752}$ |  | 2500 | 2523 | 2047 | ${ }_{197}^{2370}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 156 | ${ }_{1483}^{188}$ | 1804 | 1327 |  |  |  |  |  |  |  |  |  |  |  | ${ }^{8904}$ |  |  |  |  |
|  | d | $\begin{aligned} & 11604 \\ & 11620 \\ & 072 \end{aligned}$ |  |  | 0929 | 0849 | 0769 | 0689 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 550 |  | 108 |  |  |  |  |
|  | $50^{\circ}$ | $49^{\prime 9}$ |  |  |  | ${ }^{45}$ | $144^{4}$ | ${ }^{43}$ | $4{ }^{4}$ | $4^{41^{+}}$ |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $16^{\circ}$ Cosine． | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $16^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | 32 | $33^{\prime}$ | $34^{\prime}$ | $35^{\prime}$ | 36 | 37 | $38^{\prime}$ | $39^{\prime}$ | $30^{\prime}$ | $31^{\prime}$ | 32 | 33 | $34^{\prime}$ | 35 | $36^{\prime}$ | 37 | 38 | $39^{\prime}$ |  |
|  | 9588 | 9587 | 95 | 9586 | 9585 | 9584 | 9583 | 9582 | 95 |  | 2840 | 28 | 2846 | 28 | 2851 | 285 | 28 | 860 | 2862 | 2865 |  |
| 2 | 917 | 917 | 9173 | 9171 | 9170 | 91 | 916 | 9165 | 916 |  | －5680 | 56 | 5691 | 5697 | 57 | 5708 | 5714 | 5719 | 5725 | 5730 |  |
| 3 | 87 | 8762 | 8760 | 8757 | 8755 | 875 | 87 |  | 8745 |  | 研 | 8529 | 8537 | 85 | 8554 | 8562 | 857 | 8579 | 85 | 859 |  |
|  | 3353 | 8349 | 8346 | 8343 | 8340 | 833 | 8333 | 8330 | 832 |  | 1.1361 | 1372 | 1383 | 139 | 1405 | 1416 | 142 | 1439 | 1450 | 146 |  |
| 5 | 7941 | 7937 | 703 | 29 | 7924 | 7920 | 7916 | 7912 | 790 |  |  | 4215 | 4229 | 4243 | 4257 | 42 |  | 4298 | 43 | 26 |  |
| 6 | 7529 | 7524 | 7519 | 7514 | 7509 | 7504 |  | 7494 | 7489 | 57484 | 17041 | 7058 | 7074 | 7091 | 7108 | 7125 | 7141 | 7158 | 7175 | 7191 |  |
| 7 | 71 |  |  |  |  |  |  |  | 7071 |  |  | 9901 | 920 | 9940 | 99 | 997 | 999 | ＋018 | 0037 | 05 |  |
| 8 | 6706 | 6699 | 669 | 668 | 6679 | 6672 | 6666 | 6659 | 6652 | $7 \cdot 66$ | 27 | 2744 | 27 | 27 | 2810 | 2833 | 2855 | 2877 | 290 | 292 |  |
| 9 | 6294 | 6286 | 6279 | 627 | 6264 |  |  |  | 623 | 8.62 | $2 \cdot 5561$ | 5586 | 5612 | 56 | 5662 | 568 | 5712 | 5737 | 57 | 5787 |  |
| 10 |  |  |  |  |  |  |  |  | 816 | 9.5807 | 2 | 8429 | 845 | 848 | 8513 | 854 | 85 | 8597 | 862 | 8652 | 10 |
| 11 | 54 | 5461 | 5452 | 5443 | 5434 | 5425 | 5415 | 5406 | 5397 | 10 | 3.1242 | 127 | 1303 | 13 | 136 | 139 | 14 | 145 | 1487 | 1518 | 11 |
| 12 | 5058 | 5048 | 503 | 5029 | 5019 | 50 |  |  | 4979 |  |  | 4115 | 41 | 418 | 42 | 424 | 428 | 4316 | 43 | 43 |  |
| 13 | 4647 | 4636 | 4625 | 4614 | 4604 | 45 | 4582 | 4571 | 4560 | 12.45 | 36922 | 6958 | 699 | 7031 | 70 | 7103 | 7139 | 7176 | 7212 | 7248 |  |
| 14 | 42 | 4223 |  |  | 4188 | 4 | 4165 | 4154 | 4142 | 13. |  | 9801 | 98 | 98 | 99 | 99 | 99 | 35 | 0074 | 0113 |  |
| 15 | 3823 | 3811 | 3798 | 378 | 3773 | 3761 | 3748 | 3736 | 3723 | 14.371 | 4.26 | 2644 | 2686 | 2728 | 2770 | 281 | 285 | 2895 | 293 | 297 | 15 |
| 16 | 3411 | 33 | 33 | 3371 | 3358 | 33 | 3332 | 3318 | 3305 | 15.3292 | $4 \cdot 5442$ | 5487 | 5532 | 55 | 5621 | 566 | 5710 | 55 | 5799 | 5844 | 16 |
| 17 | 299 | 29 |  |  |  | 2929 | 29 |  | 2887 | 16 | 8283 | 8330 | 837 | 8425 | 8472 | 8520 | 8567 | 14 |  | 709 |  |
| 18 | 258 | 257 | 25 |  |  | 251 | 2498 | 24 | 246 | 17.2 | 5．1123 | 117 | 122 | 12 | 13 | 137 | 142 | 1474 | 152 | 1574 |  |
| 19 | 217 | 2160 | 2144 |  | 2113 | 20 |  |  | 2050 | 18.20 | 3963 | 4016 | 406 | 412 | 4175 | 422 | 4281 | 4334 | 4387 |  |  |
| 20 | 17 | 17 | 173 |  |  | 1681 |  |  | 631 |  |  | 859 | 6915 |  | 7026 | 708 | 713 | 7193 |  |  |  |
| 21 | 1352 |  | 1317 |  |  | 1265 | 1248 | 1230 | 1213 | 20.119 | 5.9643 | 9702 | 9760 | 9819 | 9877 | 993 | 9995 | ${ }^{0} 053$ |  |  |  |
| 22 | 09 | 092 | 0904 | 0886 | 08 | 08 | 08 |  | 0794 |  | ． 24 | 2545 | 26 | 2 | 2729 | 27 | 28 |  |  | 303 | 22 |
| 23 | 0529 | 05 | 0490 |  | 04 | 0433 | 0414 |  | 0376 | $22 \cdot 03$ | ． 5324 | 5388 | 54 | 55 | 55 | 56 | 57 | 5772 | 583 |  | 3 |
| 24 | 0117 |  | 0077 |  | 0037 |  |  |  | 99 |  |  | 823 | 829 | 83 | 8431 | 849 | 856 | 8632 |  | 87 |  |
| 25 | 9705 | 9684 | 966 | 964 | 22 | 601 | 9581 | 9560 | 95 | 23 | $7 \cdot 1004$ | 107 | 11 | 12 | 1283 | 135 | 142 | 149 | 156 | 163 | 25 |
| 26 | 9293 | 927 | 9250 | 9229 | 9207 | 9185 | 9164 | 9142 | 9121 | 24.9099 | $7 \cdot 3844$ | 3916 | 398 | 4062 | 4134 | 4206 | 4279 | 43 | 4424 | 4496 | 26 |
| 27 | 8881 | 8859 | 8837 | 8814 | 87 |  |  | 8725 | 8702 | $25 \cdot 868$ |  |  | 68 |  |  |  |  | 7211 |  |  |  |
| 28 | 847 | 8446 | 8423 |  | 8377 |  | 831 |  | 82 | 26 |  |  |  |  |  |  |  | －071 |  | 2 |  |
| 29 | 805 | 803 | 8010 |  | 62 | 7938 | 7914 |  | 7865 | 27.784 | ． 2364 | 2445 | 25 | 26 | 2688 | 27 | 2850 | 2930 | 301 | 309 |  |
| 30 | 7646 | 7621 | 7596 | 7571 | 7547 | 22 | 7497 | 7472 | 7447 | 28.7422 | 8.5205 | 5288 | 53 | 5456 | 5539 | 5623 | 5707 | 579 | 587 | 5957 | 30 |
| 31 | 72 | 7209 | 7183 | 7157 | 7131 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 6822 | 679 | 676 | 674 | ， |  | 6 |  | 6610 | $30 \cdot 65$ |  |  | 106 |  | 1242 | 13 | 1420 | 15 |  |  |  |
| 33 | 6411 | 6383 | 635 | 63 |  | 627 | 62 | 6219 | 6192 | 31 | ． 3725 | 3817 | 39 | 40 | 4093 | 41 | 4277 | 43 | 446 | 45 |  |
| 34 | 59 | 59 | 594 |  | 5886 |  |  |  | 5773 | $32 \cdot 5$ |  | 66 | 67 | 685 | 694 |  |  | 7229 |  |  |  |
| 35 | 558 | 555 |  |  |  | 5442 | 5413 |  | 5355 | 33 | 405 | 9503 | 96 | 969 | 979 | 9893 | 998 | 08 | 18 | 028 |  |
| 36 | 5175 | 5145 | 5116 | 5086 | 505 | 5026 | 4996 | 4966 | 49 | 34.490 | 10.2246 | 2346 | 244 | 254 | 2647 | 274 | 2848 | 2948 |  |  |  |
| 37 | 4763 | 473 | 47 | 46 | 46 | 4610 | 4579 | 4549 | 4518 |  | $10 \cdot 50$ |  |  |  |  | 5602 |  | 5808 |  |  |  |
| 38 | 4351 | 4320 | 42 |  | 4226 | 4194 |  | 4131 | 4099 | $36 \cdot 40$ | 10 | 803 |  | 8244 | 350 | 8456 | 8562 | 3667 |  | 87 |  |
| 39 | 3940 | 390 |  |  |  | 377 |  |  | 3681 | $37 \cdot 364$ |  | 08 | 098 | 10 | 120 | 13 | 14 | 152 | 163 | 17 |  |
| 40 | 3528 | 3495 | 3462 | 3 | 3395 | 3362 | 3329 | 329 | 3262 | 229 | $11 \cdot 3606$ | 3718 |  | 39 | 4052 | 416 | 427 | 438 | 448 | 4610 | 40 |
| 41 | 311 | 3082 | 3048 | 3014 | 2980 | 2946 | 2912 | 2878 | 2844 | 39.2810 | 11.6446 | 6561 | 667 | 6789 | 6904 | 7018 | 7132 | 7247 | 736 |  |  |
| 42 | 270 | 26 | 2635 |  |  | 2530 |  |  | 2426 | 40.239 | 11.9286 | 9404 | 9521 | 9638 |  | 9872 |  | －106 |  |  |  |
| 43 | 2292 | 225 | 222 | 21 |  |  | 2079 |  | 200 | $41^{1} 1$ | 12 | 22 | 23 |  |  | 27 | 28 | 296 |  | 320 |  |
| 44 | 188 | 184 | 180 | 1771 |  | 169 | 166 | 1625 | 158 | $42 \cdot$ | 12 | 508 | 52 | 53 | 545 | 55 | 57 | 5826 |  |  |  |
| 45 | 1469 | 14 | 1394 | 1357 | 1320 | 1283 | 1245 | 1208 | 1170 | 43.1133 | $12 \cdot 7807$ | 7932 | 8058 | 8183 | 8309 | 8434 | 8560 | 3685 | 8811 | 8936 |  |
| 46 | 10 | 1019 | 0981 |  | 0905 | 0867 |  |  | 0752 | 44.071 | 13.06 |  |  |  |  |  |  |  |  |  |  |
| 47 | 064 | 0606 | 056 | 05 | 0490 |  |  |  |  |  | 13 | 36 |  |  | 40 |  | 42 | 44 | 453 | 46 |  |
| 48 | 023 | 01 | 0154 | 01 | 0075 | 1035 |  |  |  | 45.9875 | 13 | 64 | 65 |  | 6863 |  |  | 72 |  |  |  |
| 49 | 982 |  |  |  |  |  | 78 | 537 | 9497 | 46.945 | 13 |  |  | 9577 | 971 |  |  | 1124 | 0260 |  |  |
| 50 | 941 | 93 | 9327 | 9286 | 20 |  |  | 9120 | 907 | 47．903 | 14.2008 | 214 | 22 | 2426 | 256 | 270 | 284 | 2984 | 3123 | 326 |  |
| 51 | 89 | 895 |  | 887 | 8829 | 878 |  |  |  |  |  |  |  | 52 |  |  |  |  |  |  |  |
| 52 | 858 |  |  |  | 14 | 837 | 8328 |  | 8241 | $49 \cdot 81$ | 14.76 |  |  |  |  |  |  |  |  |  |  |
| 53 | 817 | 81 | 8087 | 8043 | 799 | 7955 | 791 | 7867 | 7823 | 50．777 | 15.05 | 067 | 0824 |  | 1119 |  | 14 | 563 | 710 |  |  |
| 54 | 776 | 7718 | 767 |  |  |  |  |  |  | 51 | 15 | 35 |  | 38 | 39 |  | 42 | 44 |  |  |  |
| 55 | 735 | 7305 | 7260 | 7214 | 69 | 7123 | 70 | 7032 | 6986 | 52.6940 | 15.6208 | 636 | 65 | 66 | 6822 | 69 | 7129 | 7282 | 743 | 75 | 析 |
| 56 | 693 |  | 6846 | 6800 | 6754 | 6707 | 6 | 6614 | 6567 | 53.6521 | $15 \cdot 9049$ | 9205 |  |  | 9673 | 9829 | 9986 |  |  |  |  |
| 57 | 65 |  |  |  | 6339 |  | 6244 | 6196 | 6149 | 54．6102 |  | 48 |  |  |  |  |  |  |  |  |  |
| 58 | 611 | 60 | 60 | 597 | 5923 |  | 582 | 577 | 57 | 55.5 | 16.4 | 48 |  | 52 |  | 55 |  | 586 | 602 |  |  |
| 59 | 570 |  |  | 55 |  |  |  | 析 | 5312 | $56 \cdot 526$ |  | 773 |  |  | 822 |  |  | 872 |  |  |  |
| 60 | 5292 | 5242 | 5193 | 5143 | 5093 | 5043 |  |  | 894 | 57－4844 | 17．0409 | 577 | 0744 | 0911 | 107 |  | 1413 | 1580 | 174 | 191 |  |
|  | 48 |  |  |  |  |  |  | 4526 |  |  | $17 \cdot 32$ |  |  |  |  |  |  |  |  |  |  |
| 62 | 4468 | 441 | 43 | 43 | 4263 | 421 | 4160 | 4108 | 405 |  | $17 \cdot 60$ | 62 |  | 66 | 67 |  |  | ， | 74 |  |  |
| 63 | 405 | 4004 | 39 |  |  |  |  |  | 36 | $60 \cdot 35$ | 8930 |  |  |  |  |  |  |  |  | 510 |  |
| 64 | 364 |  |  |  | 3433 |  |  | 3273 | 228 | $61^{\circ}$ | 18.17 |  |  |  |  |  | 2841 |  |  | 倍 |  |
| 65 | 323 | 3179 | 3125 | 307 | 3018 |  | 2910 | 2856 | 280 | $62 \cdot$ | 18.46 | 479 | 497 | 51 | 533 | 55 | 569 | 587 | 606 | 62 |  |
| 66 | 2821 | 2766 | 2712 | 265 |  |  |  |  |  |  |  |  |  | 8002 |  |  | 硡 |  |  |  |  |
| 67 | 240 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 1997 |  | 18 |  |  |  |  |  | 154 | 65 |  |  |  |  | 38 |  | 4268 | 4317 |  |  |  |
| 69 | 15 | 1529 | 147 | 1414 | 1357 | 130 | 1243 | 118 | 112 | $66 \cdot 10$ | 19.59 | 61 |  | 65 | 6740 |  |  | 7317 | 75 | 770 |  |
| 70 | 117 | 1116 | 1485 | 10 | 0942 | 088 | 0826 | 0768 | 0709 | 67．065 | 19．8811 | 9006 | 92 |  | 9592 | 9787 | 9982 | 177 | 0372 | 56 | 90 |
| 71 | 07 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 03 | 02 | 0231 |  |  |  |  | 9 | 9872 | 68.9812 | 20 | 4692 | 489 |  | 529 |  |  | 58 |  | 629 |  |
| 73 | 99 | 98 | 98 | 9757 | 9697 | 963 | 95 | 95 | 94 | 69.939 | $20 \cdot 731$ | 753 | 77 | 79 | 81 | 83 | 85 | 875 | 895 | 916 |  |
| 74 | 9527 |  |  |  |  |  |  | 9097 |  | 70．897 |  |  | 矿8 |  | 8 | 2 |  | 61 | 182 |  |  |
| 75 | 9115 | 9053 | 899 |  | 8866 | 8804 | 8742 | 68 | 8617 | 71.855 | $21 \cdot 301$ | 322 | 343 | 363 | 384 | 405 | 42 | 447 | 468 | 489 |  |
| 76 | 8703 | 864 | 8577 | 8514 |  | 838 | 8325 | 析 | 819 | 72．813 | 21.585 | 606 | 627 | 64 | 669 |  |  | 733 |  |  |  |
| 77 | 829 | 82 | 8164 | 8100 | 8036 | 79 | 7908 | 7844 | 7780 | 73.771 | 21.86 | 890 | 91 | 9336 | 955 | 976 |  | －19 | 04 | 062 |  |
| 78 | 7889 |  |  |  |  | 矿 |  | 7427 | 保 | 74．7297 |  | 749 | ¢ 13 | 2185 | 240 | 2619 | 2837 | 析 | 327 |  |  |
| 79 | 7468 | 7402 | 733 | 7271 | 206 | 7140 | 7075 | 700 | 6943 | 75．6878 | 22.437 | 459 | 4813 | 5033 | 5253 | 5474 | 5694 | 591 | 613 | 635 |  |
| 80 | 7056 | 69 | 6923 | 57 | 6791 | 6724 | 6658 | 6592 | 6525 | 76.6458 | 22.7212 | 743 | 7658 | 788 | 810 | 832 | 85 | 877 | 89 | 922 | 80 |
| 81 | 664 | 6577 | 6510 |  |  | 6309 | 2， | 6174 | 610 | ＇603 | 23.00 | 027 | 050 | 0730 |  | 1 | 408 | 163 | 185 |  |  |
| 82 | 6232 | 6764 | 6097 |  |  | 5 |  | 5380 | 5688 | 5621 |  | 5 | 331 | 357 | 3807 | 403 | 426 | 449 | 758 | 950 |  |
| 83 | 5820 | 5752 | 5683 | 56 | 55 | 5477 | 5408 | 5339 | 5270 | 79.520 | 23.573 | 596 | 619 | 6427 | 665 | 689 | 712 | 735 | 758 | 781 |  |
| 84 | 5409 | 5339 | 析 |  | 硣 | 5061 | 4991 | 4921 | 485 | 80.478 | 23.8573 | 8807 | 904 | 9276 | 951 | 974 | 9978 | －212 | 0446 | 06 |  |
| 85 | 4997 | 4927 | 4856 |  | 17 |  |  |  |  | 431 | 24.413 | 1650 | 887 | 2124 | 236 | 259 | 283 | 012 | 330 | 354 | 85 |
| 86 | 4585 | 4514 | 4443 | 4371 | 480 | 229 |  |  |  |  |  |  |  |  |  |  | 568 |  |  |  |  |
| 87 | 417 | 410 | 4029 | 3957 | 388 | 381 | 3741 | 366 | 3596 | 83.352 | 24.709 | 733 | 757 | 7821 | 806 | 830 | 8549 | 879 | 9 | 927 |  |
| 88 | 3761 | 3689 | 3616 | 3543 |  | 析 | 23 | 2 | 317 |  | 24•9933 | －179 | 042 | 0670 | 091 | 116 | 140 | 165 | 189 | 272 | 88 |
|  | 3350 | 3276 | 3202 | 3129 | 305 | 2981 |  | 833 | 2759 | 85.2685 | 5 | ， | 270 | 矿 | 376 | 4015 | 426 | 451 | 475 | 析 |  |
| 90 | 293 | 2863 | 2789 | 2714 | 2640 | 2565 | 490 | 2415 | 2341 | 86．2266 | 25.5614 | 586 | 611 | 6367 | 6618 | 686 | 7120 | 737 | 762 | 87 | 90 |
| 91 | 252 | 2451 | 2375 |  | 2225 | 2149 | 2074 | 1998 | 192 | $87 \cdot 184$ | 25.845 | 8708 | 896 | 921 | 946 | 972 | 9976 | 230 | 048 |  | 91 |
| 92 | 2174 | 2038 | 1962 | 1886 | 18 | 1733 | 63 | 1580 | 150 | 88.1427 | 26.12 | 155 | 18 | 206 | 232 | 257 | 283 | 309 | 334 | 360 | 92 |
| 93 | 1702 | 1626 | 1548 | 14 | 139 | 1317 | 1240 | 1163 | 108 | $89 \cdot 1008$ | 26.49 | 4391 | 465 | 776 | 518 | 543 | 56 | 594 | 220 | 646 | 93 |
|  | 1291 | 1213 | 1735 | 141 | 2979 | 0901 | 0823 | 074 | 066 | 90.0589 | 26.697 | 723 | 749 | 776 | 802 | 828 | 8547 | 8809 | 907 |  |  |
| 95 | 087 | 08 | 0722 | 0643 | 056 | 0485 | 0406 | 0327 | 0248 | 91.016 | 2698 | ＊ 079 | 03 | 0609 | 087 | 113 | 140 | 16 | 19 | 2198 | 95 |
|  | 0467 | 0388 | 0308 | 0229 | 0149 | 069 | 990 | 9910 | 9830 |  |  |  |  |  |  |  | 426 | 528 |  |  |  |
|  | ＋055 | 9975 | 9895 | 9814 | 9734 | 9653 | 9573 | 949 | 9412 | 92.933 | 27.5495 | 5765 | 6036 | 6306 | 6577 | 6847 | 7118 | 7388 | 765 |  |  |
|  | 9643 | 9562 | 9481 | 9400 | 93 | 9237 | 9156 | 075 | 8993 | $93 \cdot 8911$ | $27 \cdot 8335$ | 860 | 888 | 9155 | 9428 | 970 | 9975 | ＋248 | 052 | 079 | 98 |
|  | 9232 | 9150 | 9068 | 8986 | 89 | 8822 | 8739 | 8657 | 8575 | 94．8492 | 28.175 | 451 | 1727 | 2003 | 2279 | 2556 | 2832 | 3107 | 3383 | 3659 | 99 |
| 100 | 8820 | 8737 | 8654 | 8572 | 8489 | 8406 | 8323 | 8239 | 8156 | 95．8073 | $28: 4015$ | 4294 | 4573 | 4852 | 5131 | 5410 | 5688 | 5967 | 6246 | 6525 | 100 |
|  | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | $26^{\prime}$ |  | $24^{\prime}$ | $23^{\prime}$ | $22^{\prime}$ | $21^{\prime}$ | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | ${ }^{27}$ | 26 | 25 | 24 | $23^{\prime}$ |  |  |  |

TRAVERSE TABLES．

| 16 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $6^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 41 | 42＇ | $43^{\prime}$ | $44^{\prime}$ | $45^{\prime}$ | 46＇ | 47＇ | 48＇ | $49^{\prime}$ |  | $41^{\prime}$ | 42＇ | 43 | 44 | 45＇ | 46 | 47＇ | $48^{\prime}$ |  |  |
|  | 9580 | 9579 | 9578 | 9577 |  | 9576 | 9575 | 9574 | 9573 | 957 | 868 | 2871 |  | 2876 | 2879 | 2882 | 2885 | 28 |  |  |  |
|  | 91 | 915 |  |  |  | 9 |  | 91 | ， | ． 91 | 析 | 57 |  | 575 | 575 | 5764 | 5769 | 5775 |  |  |  |
|  | 8740 | 8737 | 8735 | 873 | 8730 | 8727 | 8725 | 87 | 872 |  |  | 861 | 86 | 8629 | 8638 | 8646 | 8654 | 86 | 8671 | 86 |  |
|  |  |  | 8313 |  |  |  | 830 | 82 | 8293 |  | －1472 | 148 | 149 | 1506 | 15 | 1528 | 153 | 1550 | 1561 |  |  |
|  | 789 | 7895 | 7891 | 7887 | 7883 | 7879 | 7874 | 7870 | 786 | $4 \cdot 786$ | 1.4340 | 43 | 436 | 4382 | 4396 | 4410 | 442 | 4438 | 44 |  |  |
|  | 74 | 7474 | 7469 | 7464 | 7459 | 7454 | 7449 | 7444 | 7439 | 5.743 | 17208 | 7225 | 7242 | 7258 | 7275 | 7292 | 7308 | 7325 | 7342 | 735 |  |
|  | 7059 | 7053 | 70 |  |  | 7030 |  |  | 7012 |  |  | 0096 | 0115 | 0135 |  | ， | 018 | 21 | 2 | O2 |  |
|  | 6639 | 663 | 6626 |  | 6612 | 6606 | 65 |  |  |  |  | 296 | 2989 | 3011 |  | 305 | 3078 | 3100 | 312 |  |  |
|  | 6219 | 621 | 6204 | 5197 | 612 |  | 617 |  |  |  |  | 583 | 5862 | 588 | 59 | 5938 | 596 | 5988 | 601 | 603 |  |
| 10 | 57 |  |  |  |  | 57 |  |  |  |  |  | 8708 | 8736 | 876 | 8792 | 8820 | 8847 | 887 | 390 | 893 | 0 |
| 11 | 53 | 5370 | 5360 | 5351 | 5342 | 5333 | 5324 | 5314 | 5305 | 10.5296 | 3.1548 | 1579 | 1610 | 1640 | 1671 | 170 |  |  |  |  |  |
| 12 | 4959 | 494 | 493 | 49 | 49 | 4909 | 489 | 48 | 4878 | 11. | 3446 | 445 | 4483 | 45 | 45 | 45 | 4617 | 4650 | 4684 |  |  |
| 13 | 4539 | 4528 | 4517 | 45 |  | 4484 | 4473 | 4462 | 4452 | 12 | 284 | 732 | 735 | 73 | 7429 | 74 | 55 | 7538 | 75 | 76 | 13 |
| 14 | 4119 | 4107 | 409 | 4083 |  | 4060 | 4048 | 4036 | 4025 |  | 4.0152 | 01 |  | 0269 | 0308 | 03 | 038 | 0425 | 046 | 050 | 14 |
| 15 | 36 | 3686 | 36 | 3661 | 3648 | 3636 | 3623 | 3611 |  | 14 | 4．3020 | 306 | 3104 | 3146 | 3188 | 322 | 327 | 331 | 335 | 339 | 15 |
| 16 | 3278 | 3265 | 3252 |  |  |  |  | 3185 | 3171 | 15.315 |  | 5933 | 59 | 6022 | 6067 | 61 | 615 | 6201 | 6245 | 629 | 16 |
| 17 | 28 |  |  |  |  |  |  |  |  |  |  |  | 8851 |  |  | 899 |  | 9088 | 9135 |  | 17 |
| 18 | 2438 | 24 | 24 | 239 | 2378 | 23 | 23 | 2333 | 23 | 17. | \％ | 167 | 172 | 17 | 1825 | 187 | 1925 | 1976 | 2026 | 2076 | 18 |
| 19 | 2018 |  |  |  |  |  | 1923 |  | 1891 | 18.187 | 5.4493 | 45 | 459 | 46 | 47 | 475 | 4810 | 486 | 4916 |  | 19 |
| 20 | 1598 |  |  |  |  |  |  |  | 64 | 19.144 |  | 4， | 47 | 7528 | 75 | 763 | 69 | 775 | 780 |  | 20 |
| 21 | 1178 | 1160 | 1143 | 1125 | 1108 | 1090 | 1072 | 1055 | 1037 | 20.1019 | 6.022 | 0287 | 0346 | 0404 |  | 052 | 580 |  |  |  | 21 |
| 22 | 07 | 073 | 072 |  | 0684 |  |  |  | 0610 |  |  | 315 |  | 32 | 3342 |  | 3464 | 3526 | 3587 | 364 | 22 |
| 23 | 0338 |  | 021 |  |  | 0241 |  |  |  | 22.01 | 6.5965 | 6029 | 609 | 615 | 62 | 62 | 6349 | 6413 | 6477 | 65 | 23 |
| 24 | 9917 | 98 | 987 | 9857 | 9837 | 9817 | 97 | 9777 | 9757 |  |  | 89 | 89 | 9033 | 9100 | 9167 | 9234 | 331 | 9368 | 943 | 24 |
| 25 | 9497 | 9477 | 9456 | 9435 |  | 9393 | 93 |  | 9330 | 23.93 | $7 \cdot 1701$ | 177 | 184 | 19 | 1979 | 2049 | 2119 | 218 | 325 | 232 | 25 |
| 26 | 9077 | 9056 |  |  |  |  |  |  |  |  |  | 4641 | 4714 |  |  | 493 | 5003 | 5076 |  |  | 26 |
| 27 | 865 | 8635 |  |  |  |  | 852 |  |  |  |  |  |  |  |  | 781 |  | 7963 |  | E1） | 27 |
| 28 | 823 | 8214 | 8190 | 8167 | 8143 | 8120 | 809 | 8073 | 804 |  |  | 038 | 046 | 05 | 0617 | 069 | 0773 | 085 | 092 | 100 | 28 |
| 29 | 7817 |  |  |  |  |  |  |  |  |  |  | 3254 | 33 | 34 |  |  | 3658 |  | 38 | 393 |  |
| 30 | 7397 | 7372 | 7347 |  |  | 7271 | 72 | 7221 | 7196 | 28.7171 | 604 | 612 | 62 |  |  |  | 6542 |  | 6710 |  | 30 |
| 31 | 697 | 6951 | 6925 | 6899 | 6873 | 6847 | 6821 | 6795 | 676 | 29.674 | 8.8909 | 8995 | 9082 | 916 | 925 | 934 | 9427 |  | 960 |  | 31 |
| 32 | 65 | 653 | 650 |  |  | 6423 | 639 |  |  |  |  |  |  |  |  |  | 2312 |  |  |  | 32 |
| 33 | 6137 | 6109 | 60 |  | 6026 |  | 59 |  |  | 31.588 |  | 4737 | 482 |  |  | 510 |  | 5289 |  | 547 | 33 |
| 34 | 5716 | 568 | 56 |  |  | 5574 | 5546 | 5517 | 5489 | 32.546 | 9.75 | 760 | 7703 | 7797 | 7892 | 798 | 808 | 817 | 827 | 836 | 34 |
| 35 | 5296 | 5267 |  |  |  | 5150 | 5121 |  |  | 33.5032 | 10.0381 | 0479 | 057 | 0674 | 0771 | 08 | 0966 | 1064 | 11 | 125 | 35 |
| 36 | 487 | 4846 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3951 |  |  | 36 |
| 37 | 4456 | 4 | 43 |  |  |  |  |  |  | 35.41 |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 40 | 4004 | 39 | 394 |  | 3877 | 384 |  |  | $36 \cdot 37$ |  |  | 919 |  |  | 951 | 9620 | 972 | 9832 |  | 38 |
| 39 | 3616 |  |  |  |  | 5 | 3420 |  |  | $37 \cdot 332$ | $11 \cdot 18$ | 19 |  |  |  | 2397 | 250 | 261 |  |  |  |
| 40 | 319 | 3162 | 31 |  |  | 3029 | 2995 | 296 | 292 | 38.2894 | 11.472 | 483 | 494 | 50 | 51 | 527 | 539 | 55 |  | 57 | 40 |
| 4 | 27 | 2741 |  |  |  | 2604 | 2570 | 2535 | 2501 | 39.246 | 11.758 | 7704 | 7818 |  |  |  |  | 8389 |  |  | 41 |
| 42 | 23 | 2321 |  |  |  | 2180 | 2145 |  | 2074 | $40 \cdot 203$ | 12.04 | 0574 | 069 |  |  |  |  |  |  |  | 42 |
| 43 | 1935 | 1900 |  |  |  | 1756 | 1720 | 1684 | 1647 | 41.161 | 12.33 | 344 | 35 | 3685 |  | 392 | 40 | 416 | 428 |  | 43 |
| 44 | 15 | 1479 | 1 |  |  |  | 1295 |  |  | 42．11 |  |  | 643 |  |  | 680 | 69 | 7051 |  |  | 44 |
| 45 | 10 | 1058 |  |  |  |  |  |  |  | 43.075 | 12.90 | 9187 | 9312 | 9438 | 9563 | 9688 | 9814 | 939 |  |  | 45 |
| 46 | 067 | 0637 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 025 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 571 |  |  | 47 |
| 48 | 9835 |  |  |  |  | 9634 | 9594 |  | 9513 | 45.947 | 13.76 |  | 79 |  |  |  | 84 | 86 |  | 386 | 48 |
| 49 | 941 |  |  |  |  |  |  |  |  | 46 | 14.0 | 0670 | 08 |  |  | 121 | 135 | 148 |  |  | 4 |
| 50 | 899 |  |  |  |  | 87 |  |  |  | $47 \cdot 861$ | 14.3 | 35 | 36 | 38 |  | 409 | 423 | 4377 | 451 | 465 | 50 |
| 51 | 85 | 8532 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 815 |  |  |  |  |  |  |  |  |  | 14.91 |  |  |  |  |  |  | 015 |  |  | 52 |
| 53 | 773 |  |  |  |  | 7513 |  |  |  |  | 2088 |  | 23 |  |  |  | 28 | 303 | 31 |  | 53 |
| 54 | 73 |  |  |  |  |  |  |  |  | 51.69 | 仿 |  | 517 |  |  |  | 577 | 592 | 607 |  | 54 |
| 55 | 68 |  |  | 675 |  |  |  |  |  | 52.64 | 15.77 | 788 |  |  |  | 8508 | 8661 | 8814 | 8967 | 12 | 55 |
| 56 | 6474 | 6427 | 638 | 6334 |  | 6240 |  |  | 6099 |  |  |  | 22 |  |  |  |  |  |  |  | 56 |
| 57 | 6054 |  |  |  |  | 5816 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 57 |
|  | 563 |  |  |  |  | 539 |  |  |  | 55.51 | 16.63 |  |  |  |  |  |  |  |  |  | 58 |
| 59 | 5214 | 516 |  |  |  | 496 |  |  | 48 |  |  |  |  |  |  |  |  | 036 | 05 |  | 59 |
| 60 | 4794 | 4744 | 46 |  | 459 | 4543 | 4493 | 4442 | 43 | 57 | －20 | 22 | 241 | 258 | 27 | 29 | 308 | 325 | 34 |  | 60 |
| 61 | 437 | 432 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 61 |
| 62 | 39 | 3902 | 385 | 3 |  | 3694 | 364 |  | 3538 | － 3 | 17.78 |  | 816 |  |  |  |  |  |  |  | 52 |
| 63 | 35 | 348 |  |  |  | 3270 |  |  |  | －30 | ．06 |  | 103 |  |  |  |  |  |  |  | 63 |
| 64 | 31 |  |  |  |  |  |  |  |  |  |  |  | ， |  |  |  |  |  |  |  |  |
| 65 | 2693 | 263 | 258 | 2530 | 2476 | 2421 | 23 | 231 | 22 | 22 | 18.6422 |  | 678 |  |  |  |  | 690 | 787 |  | 65 |
| 66 | 22 | 221 |  |  |  | 1997 |  |  |  |  |  | 947 | 965 |  |  |  |  |  | ， |  | 66 |
|  | 18 |  |  |  |  | 1573 |  |  |  |  |  |  | 253 |  |  |  |  |  | \％ |  | 67 |
| 68 | 1433 | 137 |  |  |  | 1149 |  |  |  | 65.09 | 19. |  |  |  |  |  |  |  | 矿 |  | 68 |
| 69 | 10 | 095 |  |  |  | 0724 | 066 | 06 |  | $66 \cdot 04$ |  |  | 82 |  |  | 88 |  | 220 | 943 | 96 | 69 |
| 70 | 0593 |  |  |  |  |  |  |  |  | $67 \cdot 0065$ |  | 0957 | 15 | 134 |  | 1737 | 1932 | 2127 | 232 |  | 70 |
| 71 | 0173 |  |  |  |  | ， |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 975 | 969 | 96 | 9572 | 9512 | 9451 |  | 93 | 927 | 8.92 | 20．64 |  | 69 |  |  | 75 |  | 7902 | 810 |  | 72 |
| 7 | 9332 | 92 | 9210 | 9149 | 65 | 9027 | 8964 | 8905 | 8846 | 69．87 | 20.93 | 957 | 9773 | 997 | －180 | 038 | 0587 | 079 | 093 | 119 | 73 |
| 74 | 8912 | 8850 |  |  | 65 | 86 | 85 |  | 8416 | 70．8354 | 21.22 | 244 | 26 | 285 |  | 析 | 347 | 6 | 仿 |  | 74 |
| 75 | 84 | 8430 | 836 | 8304 | 8241 | 8179 | 811 | 805 |  | 7179 | 21.51 | 531 | 55 | 572 | 59 | 614 | 635 | 656 | 677 |  | 75 |
| 76 | 80 | 8009 |  |  |  | 7754 | 7691 |  | 7563 | 7071 | 21.797 | 8182 | 839 | 86 |  | 90 | 212 | 945 | 966 |  | 76 |
|  | 7652 |  |  |  |  | 7330 | 7265 |  | 析 | 707 | 08 | 105 | 126 |  |  | 1911 | 210 | 234 | 253 |  | 77 |
| 78 | 7232 | 716 | 7102 | 36 | 6971 | 6906 | 6840 | 6775 | 6709 | $4 \cdot 66$ | 22.37 | 392 | 414 | 435 | 457 | 479 | 50 | 522 | 54 | 56 | 78 |
| 79 | 6812 |  |  |  |  | 6481 |  | 849 |  | $75 \cdot 6216$ |  | 6795 | 7015 | 723 | 745 | 7075 | 789 | 811 | 8335 |  | 79 |
| 80 | 6392 | 6325 | 62 | 191 | 24 | 6057 | 5990 | 5923 | 5856 | ． 57 | 443 | 析 | 98 |  |  | 矿 | 0780 |  | 1225 |  | 80 |
| 81 | 59 |  | 5 | 5769 |  | 5633 | 556 | 549 | 5429 | 77•536 |  | 2536 |  |  |  |  |  |  |  |  |  |
| 82 | 555 | 548 | 541 | 5346 | 277 | 5209 | 514 | 5071 | 50 | 78.4933 | 51 | 5 | 56 |  |  | 632 | 654 | 677 |  | 723 | 82 |
| 83 | 5131 | S | 4971 | 4923 | 4854 | 仡 | 471 | 464 | 4575 | $0 \cdot$ | $23 \cdot 8047$ | 827 | 8509 |  | 析 | 203 | 4319 | 666 | 989 |  |  |
| 84 | 4711 | 464 | 4571 | 45 | 443 | 43 | 429 | 421 | 4148 | 80＇407 | 24.091 | 114 | 138 | 16 | 18 | 208 | 2319 | 255 | 278 |  | 84 |
| 85 | 4291 | 4220 | 4149 |  |  | 3936 |  |  | 3722 | 81．3650 | $24 \cdot 3783$ | 4020 | 4256 | 4493 |  | 4967 | 52 | 5440 | 5677 |  | 85 |
| 86 | 3871 | 3798 |  |  |  |  |  |  |  |  |  |  | ， |  |  |  |  |  | 856 |  | 86 |
| 8 | 345 | 3378 | 3306 | 3233 | 31 | 308 | 301 | 29 | 2868 | 83.27 | 24.95 | 9761 | ＋00 | 02 |  | 731 | 2985 | 2103 | ， | 458 | 87 |
| 88 | 303 | 2957 | 2884 | 2810 | 2737 | 2663 | 25 | 2515 | 41 | 84.23 |  | 2632 | 287 | 312 | 3368 | 3613 | 3858 | 410 | 434 | 459 | 88 |
| 89 | 261 | 253 |  |  |  |  | 173 | 163 | 矿 | 85.940 | 25 325 | 5503 | 575 | 5975 | 624 | 6435 | 674 | 699 | 7238 | 748 |  |
| 90 | 2191 | 2115 | 40 |  | 90 | 181 | 173 | 16 | 1588 | $86 \cdot 1512$ | 25.8123 | 837 | 862 | 8875 | 9126 | 9377 | 962 | 987 |  | 03 | 0 |
| 91 | 177 | 1694 | 1618 | 1542 | 1466 | 13 | 1314 | 237 | 161 | $87 \cdot 108$ | $26^{\circ} \mathbf{0 9 9 1}$ | 124 | 1498 | 175 | 2005 | 2259 | 251 | 276 | 301 | 327 | 91 |
| 9 | 1350 | 1274 | 1197 | 1720 | 析 | 966 | 089 | 087 | 0734 | 065 | $26 \cdot 3859$ | 4115 | 4372 | 4628 | 488 | 514 | 539 | 565 | 590 |  | 92 |
| 93 | 095 | 0853 | 07 | 0697 | 0619 | 054 | 0463 | 0385 | 0307 | 89.0229 | $26^{6} 675$ | 698 | 72 | 75 | 7763 | 8023 | 828 | 854 | 880 |  | 93 |
| 9 | 05 | 043 | 0353 | 0275 | 0196 | 0117 | －038 | 59 | 80 | 89.9801 | 26.959 | 985 | 119 | 038 |  | 0905 | 116 | 142 | 169 | 19 | 94 |
| 95 | 009 |  |  |  |  |  |  |  |  | 93 | $\underline{27 \cdot 2463}$ | 2728 |  |  |  | 3786 | 4051 | 4316 | 4580 |  | 95 |
|  | 9670 |  |  |  |  | 289 | 978 | 910 | 9027 | ， 81818 | 27 | 5599 | 886 | －134 |  | 6 |  |  |  |  | 96 |
| 97 | 925 | 916 |  |  |  | 88 | 876 | 8681 | 600 | $92 \cdot 85$ | 27 | 846 | 8740 | 90 |  | 9550 |  |  | 03 | 063 | 97 |
|  | 8830 | 8748 |  | 8584 |  | 42 | 8338 |  | 8173 | 号 | ， | 1340 | 1613 | 1886 | 215 | 2432 | 寿 | 2978 | 325 | 352 | 98 |
|  |  |  |  |  |  |  |  |  | 746 | 94.76 | $28 \cdot 393$ | 421 | 4487 | 47 | 503 | 5314 | S |  | 61 | 6417 |  |
| 100 | 7990 | 7906 | 7823 | 7739 | 7655 | 7571 | 7488 | 7404 | 7320 | $95 \cdot 723$ | 28.6803 | 7082 | 7361 | 7639 | 7918 | 8196 | 8475 | 8753 | 9032 | 9310 | 100 |
|  | $20^{\prime}$ | $1{ }^{19}$ | 1 $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ |  | 12 | $1^{\prime}$ | $20^{\prime}$ | $19^{\prime}$ |  | 17 | 16 | 15 | 14 | $113^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES

| $16^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $16^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | $51^{\prime}$ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | 55 | $56^{\prime}$ | 57 | $58^{\prime}$ | $59^{\prime}$ | $50^{\prime}$ | $51^{1}$ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | $58^{\prime}$ | $59^{\prime}$ |  |
|  | 9572 | 9571 | 9570 | 9569 | 9568 | 9567 | 9566 | 9566 | 9565 | 9564 | 2896 | 2899 | 2901 | 2904 | 2907 | 2910 | 2913 | 2915 | 29 | 2921 |  |
|  | 9143 | 9141 | 9140 | 9138 | 9136 | 9135 | 9133 | 9131 | 9129 | 1.9128 | 5792 | 5797 | 5803 | 5808 | 5814 | 5820 | 5825 | 5831 | 583 | 5842 |  |
|  | 8715 | 8712 | 8709 | 8707 | 8704 | 8702 | 8699 | 8697 | 8694 | 2．8692 | 8688 | 8696 | 8704 | 8713 | 8721 | 8729 | 8738 | 8746 | 87 | 8763 |  |
|  | 8286 | 8283 | 8279 | 8276 | 8273 | 8269 | 8266 | 8262 | 8259 | 3．8256 | $1 \cdot 1584$ | 1595 | 1606 | 1617 | 1628 | 1639 | 1650 | 1661 | 1673 | 16 |  |
| 5 | 7858 | 7853 | 7849 | 7845 | 7841 | 78 | 7832 | 7828 | 7824 | $4 \cdot 7819$ | $1 \cdot 4479$ | 4493 | 4507 | 4521 | 4535 | 454 | 4563 | 4577 | 4591 | 4605 |  |
| 6 | 7429 | 74 | 74 | 7414 | 7409 | 74 | 7399 | 7394 | 7388 | 57383 | 17375 | 7392 | 7409 | 7425 | 7442 | 7459 | 7476 | 7492 | 7509 | 7526 |  |
|  | 7001 | 699 | 6989 | 6983 | 6977 | 697 | 6965 | 6959 | 6953 | $6 \cdot 694$ | 2.0271 | 0291 | 0310 | 0330 | 0349 | 036 | 0388 | 0408 | 042 | 0447 |  |
| 8 | 6572 | 6565 | 6559 | 6552 | 6545 | 6538 | 6532 | 6525 | 6518 | 7＊6511 | 2.3167 | 3189 | 3212 | 3234 | 3256 | 3278 | 3301 | 3323 | 3345 | 3367 |  |
|  | 6144 | 6136 | 612 | 6121 | 6113 | 6106 | 6098 | 6090 | 6083 | 8.6075 | $2 \cdot 6063$ | 6088 | 6113 | 6138 | 6163 | 6188 | 6213 | 6238 | 626 | 628 |  |
| 10 | 5715 | 5707 | 5698 | 5690 | 5681 | 5673 | 64 | 5656 | 5647 | 9．5639 | 2.8959 | 8987 | 9015 | 9042 | 9070 | 9098 | 9126 | 9154 | 918 | 920 | 10 |
| 11 | 5287 | 5277 | 5268 | 5259 | 5249 | 5240 | 5231 | 5222 | 5212 | 10.5203 | $3 \cdot 1855$ | 1885 | 1916 | 1947 | 1977 | 200 | 2038 | 206 | 21 | 2130 | 11 |
| 12 | 4858 | 4848 | 4838 | 4828 | 4818 | 4807 | 4797 | 4787 | 4777 | $11 / 4767$ | 3.4751 | 4784 | 4817 | 4851 | 4884 | 4918 | 4951 | 4984 | 501 | 50 | 12 |
| 13 | 4430 | 4419 | 4408 | 4397 | 4386 | 4375 | 4364 | 4353 | 4342 | 12．4331 | 3.7647 | 7683 | 7719 | 7755 | 7791 | 7827 | 7864 | 7900 | 793 | 79 | 13 |
| 14 | 4001 | 3989 | 3978 | 3966 | 3954 | 3942 | 3930 | 3918 | 3906 | 13.3895 | $4 \cdot 0542$ | 0581 | 0620 | 0659 | 0698 | 0737 | 0776 | 0815 | 085 | 089 | 14 |
| 15 | 3573 | 560 | 3547 | 3535 | 522 | 350 | 3497 | 84 | 471 | 14.3458 | $4 \cdot 343$ | 348 | 3522 | 3564 | 3605 | 3647 | 3689 | 3731 | 377 | 381 | 15 |
| 16 | 3144 | 313 | 31 | 31 | 3090 | 30 | 30 | 3050 | 30 | 302 | 4.6334 | 63 | 6423 | 64 | 6512 | 65 | 66 | 6646 | 6690 | 6735 | 16 |
| 17 | 2716 | 2701 | 268 | 267 | 2658 | 2644 | 2630 | 26 | 260 | 16.2586 | 4.92 | 927 | 93 | 93 | 94 | 9467 | 9514 | 9561 | 9609 | 9656 | 17 |
| 18 | 2287 | 2272 | 2257 | 2242 | 2226 | 2211 | 2196 | 2181 | 2165 | 17.2150 | 5.2126 | 2176 | 2226 | 2276 | 2326 | 2376 | 2427 | 2477 | 252 | 2577 | 18 |
| 19 | 1859 | 1843 | 1827 | 1811 | 1795 | 1779 | 1762 | 1746 | 1730 | 18.1714 | 5.5022 | 5075 | 5128 | 5181 | 5233 | 528 | 5339 | 5392 | 542 | 549 | 19 |
| 20 | 1430 | 1413 | 1397 | 1380 | 1363 | 1346 | 1329 | 1312 | 1295 | $19 \cdot 1278$ | 5.7918 | 7973 | 8029 | 8085 | 8140 | 8196 | 8252 | 8307 | 836 | 341 | 20 |
| 21 | 1002 | 098 | 0966 | 0949 | 0931 | 0913 | 08 | 0877 | 0860 | 20 | 6.0814 | 0872 | 0931 | 0989 | 104 | 110 | 1164 | 122 | 1281 | 1340 | 21 |
| 22 | 0573 | 0555 | 05 | 0518 | 0499 | 0480 | 0462 | 0443 | 0424 | 21.0406 | 6.3710 | 3771 | 3832 | 3893 | 3954 | 401 | 4077 | 4138 | 419 | 42 | 22 |
| 23 | 0145 | 0125 | 010 | 0087 | 0067 | 0048 | 0028 | p009 | 9989 | 21.9970 | 6.660 | 6669 | 6733 | 6797 | 6862 | 6926 | 6990 | 705 | 71 |  | 23 |
| 24 | 9716 | 969 | 96 | 9656 | 9635 | 9615 | 9595 | 9574 | 9554 | 22.9534 | 6.9501 | 9568 | 9635 | 9702 | 976 | 983 | 9902 | 9969 | ＋03 | 010 | 24 |
| 25 | 9288 | 926 |  |  | 03 | 91 | 9161 | 9140 | 9119 | 097 | 7.2397 | 2467 | 2536 | 2606 | 267 | 274 | 2815 | 2884 | 295 | 3023 | 25 |
| 28 | 885 | 8837 | 881 | 879 | 18772 | 875 | 872 | 27 | 8683 | 24．8661 | 529 | 5365 | 54 | 5510 | 5583 | 565 | 57 | 580 | 5872 |  | 26 |
| 27 | 8431 | 8408 | 8385 | 8362 | 8340 | 8317 | 8294 | 8271 | 8248 | $25 \cdot 8225$ | 818 | 826 | 83 | 8414 | 8490 | 85 | 8640 | 8715 | 879 | 886 | 27 |
| 28 | 8 RO 2 | 797 | ． 79 | 793 | 7908 | 7884 | 7860 | 7837 | 7813 | 26.7789 | －1085 | 1163 | 1241 | 1319 | 139 | 1475 | 1552 | 163 | 170 | 178 | 28 |
|  | 7.574 | 794 | 752 | 7500 | 7476 | 7451 | 7427 | 02 | 7378 | $27 \cdot 7353$ | $8 \cdot 3981$ | 4061 | 4142 | 4223 | 4304 | 4384 | 4465 | 4546 | 46 | 47 | 29 |
| 50 | 2145 | 7120 | 76 | 7069 | 7044 | 7019 | 6993 | 6968 | 6942 | 28.6917 | $8^{\circ} 6877$ | 6960 | 7044 | 7127 | 7211 | 7294 | 7378 | 7461 | 754 | 762 | 30 |
| 31 | 671 | 669 | 6665 | 6638 | 6612 | 6586 | 6560 | 6533 | 6507 | 29．6481 | 8.9 | 985 | 994 | －031 | 011 | 02 | 02 | 0377 | 0463 | 0549 | 31 |
| 32 | 6288 | 6261 | 6234 | 6207 | 6180 | 6153 | 6126 | 6099 | 6072 | 30．604 | 9．2668 | 275 | 2847 | 2936 | 3025 | 3114 | 3203 | 3292 | 338 | 347 | 32 |
| 33 | 5860 | 5832 | 5804 | 5776 | 5748 | 5721 | 5693 | 5665 | 5637 | 31．5609 | ． 55 | 565 | 5748 | 5840 | 5932 | 6024 | 6115 | 6207 | 62 | 639 | 33 |
| 34 | 5431 | 5403 | 5374 | 5345 | 5317 | 5288 | 5259 | 5230 | 5201 | 32．5173 | 9.8460 | 8555 | 8649 | 8744 | 883 | 8933 | 9028 | 9123 | 921 | 931 | 34 |
| 35 | 5003 | 4973 |  | 14 | 4885 | 4855 | 4826 | 96 | 4766 | 33．4736 | 10.1356 | 1453 | 1551 | 1648 | 1746 | 1843 | 1941 | 2038 | 213 | 22 | 35 |
| 36 | 4574 | 4544 | 451 | 4483 | 4453 | 4422 | 4392 | 436 | 4331 | 34．4300 | 10．4252 | 4352 | 44 | 455 | 4653 | 475 | 4853 | 4953 | 5054 |  | 36 |
| 37 | 4146 | 4115 | 408 | 4052 | 4021 | 3990 | 3958 | 392 | 3896 | 35．3864 | 10.71 | 725 | 73 | 745 | 7560 | 7663 | 7766 | 7869 | 797 | 807 | 37 |
| 38 | 3717 | 3685 | 365 | 3621 | 3589 | 3557 | 3525 | 3493 | 3460 | 36.3428 | 11.0044 | 014 | 025 | 036 | 046 | 0573 | 0678 | 078 | 089 | 095 | 38 |
| 39 | 3289 | 3256 | 3223 | 3190 | 3157 | 3124 | 3091 | 3058 | 3025 | 37．2992 | 11．294 | 3048 | 3157 | 3265 | 3374 | 3482 | 3591 | 369 | 380 | 391 | 39 |
| 40 | 2860 | 2827 | 2793 | 2759 | 2725 | 2692 | 2658 | 2624 | 2590 | 38.2556 | 11.5835 | 5947 | 6058 | 6170 | 628 | 6392 | 6504 | 6615 | 6726 | 6837 | 40 |
| 41 | 243 | 2397 | 2363 | 2328 | 2294 | 2259 | 2224 | 2189 | 215 | 39 | 11.8731 | 884 | 89 | 907 | 9188 | 9302 | 41 | 30 | 9644 | 9758 | 41 |
| 42 | 2004 | 1968 | 1933 | 1897 | 1862 | 1826 | 179 | 1755 | 1719 | $40 \cdot 1684$ | $12 \cdot 1627$ | 1744 | 1861 | 1978 | 2095 | 2212 | 2329 | 2446 | 256 | 26 | 42 |
| 43 | 1575 | 1539 | 1502 | 1466 | 1430 | 1393 | 135 | 1321 | 1284 | $41 \cdot 1248$ | 12.4523 | 4643 | 4763 | 4882 | 5002 | 5122 | 5241 | 5361 | 548 | 560 | 43 |
| 44 | 1147 | 1109 | 1072 | 1035 | 0998 | 0961 | 0923 | 0886 | 0849 | 42.0812 | 12.7419 | 7542 | 7664 | 7787 | 790 | 8031 | 8154 | 8276 | 839 | 852 | 4 |
| 45 | 0718 | 0680 | 0642 | 0604 | 0566 | 0528 | 0490 | 52 | 14 | 43.0375 | 13.0315 | 40 | 565 | 069 | 0816 | 0941 | 106 | 119 | 13 | 1442 | 45 |
| 46 | 0290 | 0251 | 021 | 0173 | 0134 | 0095 | 0056 | ＋017 | 9978 | 43.993 | 13.3211 | 3339 | 34 | 3595 | 3723 | 385 | 3979 | 4107 | 4235 |  | 46 |
| 47 | 9861 | 9821 | 978 | 974 | 9702 | 9663 | 9623 | 9583 | 9543 | 44.95 | $13 \cdot 6$ | 6238 | 63 | 649 | 6630 | 676 | 6892 | 7022 | 15 | 728 | 47 |
| 48 | 9433 | 9392 | 9352 | 9311 | 9271 | 9230 | 9189 | 9149 | 9108 | 45.9067 | 13.900 | 913 | 9270 | 9403 | 9537 | 9671 | 9804 | 9938 | ＋07 | 020 | 48 |
| 49 | 9004 | 896 | 89 | 8880 | 8839 | 8797 | 8756 | 8714 | 8673 | 46.8631 | 14.1898 | 203 | 2171 | 2308 | 2444 | 2580 | 2717 | 2853 | 298 | 12 | 49 |
| 50 | 8576 | 8533 | 849 | 8449 | 8407 | 8365 | 8322 | 8280 | 8237 | 47＊8195 | 14.4794 | 4934 | 5073 | 5212 | 5351 | 549 | 5629 | 5769 | 5908 | 6047 | 50 |
|  | 8147 | 8104 | 80 | 8018 | 7975 | 7932 | 7889 | 7845 | 7802 | $48^{\circ}$ | 14.7690 | 78 | 79 | 811 | 82 | 840 | 85 | 8684 | 882 | 8968 | 51 |
| 52 | 7719 | 7675 | 7631 | 7587 | 43 | 7499 | 7455 | 11 | 7367 | 49.7323 | 15.0586 | 073 | 0876 | 1020 | 1165 | 1310 | 145 | 1599 | 174 | 18 | 52 |
| 53 | 729 | 7245 | 7201 | 71 | 7111 | 7066 | 702 | 6977 | 6932 | 50.6887 | $15 \cdot 3482$ | 363 | 3777 | 3925 | 4072 | 4220 | 4367 | 4515 | 466 | 481 | 53 |
| 54 | 6862 | 6816 | 67 | 67 | 6679 | 6634 | 6588 | 6542 | 6496 | 51.6450 | 15.6378 | 6528 | 6679 | 6829 | 6979 | 712 | 7280 | 7430 | 758 | 773 | 54 |
| 55 | 6433 | 6387 | 634 | 6294 | 6247 | 6201 | 6154 | 610 | 6061 | 52.6014 | 15.927 | 9427 | 9580 | 9733 | 988 | －039 | 0192 | 034 | 048 | 06 | 55 |
| 56 | 6005 | 5957 | 591 | 5863 | 5816 | 5768 | 5721 | 5673 | 5626 | 53.557 | 16.2170 | 232 | 2481 | 2637 | 2793 | 2949 | 3105 | 3261 | 3417 |  | 56 |
| 57 | 5576 | 5528 | 54 | 5432 | 5384 | 5336 | 528 | 523 | 5191 | 54.5142 | $16 \cdot 506$ | 52 | 5383 | 5542 | 570 | 58 | 6018 | 6176 | 633 | 649 | 57 |
| 58 | 5148 | 5099 | 50 | 5001 | 4952 | 4903 | 4854 | 4805 | 4755 | 55． 4706 | 16796 | 8123 | 8284 | 8446 | 8607 | 8769 | 8930 | 9092 | 925 | 94 | 58 |
| 59 | 4719 | 4669 | 462 | 4570 | 4520 | 4470 | 4420 | 4370 | 4320 | 56.4270 | 17．0857 | 1022 | 1186 | 1350 | 1514 | 1678 | 1843 | 2007 | 217 | 233 | 59 |
| 60 | 4291 | 4240 | 4190 | 4139 | 4088 | 4037 | 3987 | 3936 | 3885 | $57 \cdot 3834$ | 17.3753 |  | 4 | 4254 | 4421 | 458 | 4755 | 4922 | 5089 | 5256 | 60 |
| 61 | 3862 | 3811 | 37 | 37 | 3656 | 360 | 3119 | 3501 |  | 339 | 17．6649 | 6819 |  | 715 |  |  | 矿 | 7838 | 8007 | 177 | 61 |
| 62 | 3434 | 3381 | 332 | 3277 | 3224 | 172 | 3119 | 3067 | 3014 | 59.296 | 17.9545 | 9718 | 9890 | ＋063 | 0235 | 0408 | 0580 | 0753 | 092 | 109 | 62 |
| 63 | 3005 | 2952 | 2899 | 284 | 2793 | 2739 | 2686 | 2632 | 2579 | 60.2526 | 18.2441 | 2616 | 2792 | 2967 | 3142 | 3318 | 3493 | 3668 | 384 | 401 |  |
| 64 | 2577 | 2523 |  |  | 2361 | 2307 | 2252 | 2198 | 2144 | 61.2089 | 18.5337 | 5515 | 5693 | 5871 | 6049 | 622 | 6406 | 6584 | 676 | 694 | 5 |
| 65 | 2148 | 93 | 2039 | 198 | 1929 | 1874 |  | 64 | 1709 | $62 \cdot 1653$ | 18：8233 | 8414 | 859 | 8776 | 8956 | 913 | 9318 | 94 | 968 |  | 65 |
| 66 | 1720 | 1664 | 1608 | 1553 | 1497 | 1441 | 138 | 132 | 1273 | $63 \cdot 1217$ | 19.112 | 1312 | 1496 | 1680 | 1863 | 204 | 223 | 2414 |  |  | 66 |
| 67 | 1291 | 1235 | 1178 | 1122 | 1065 | 1008 | 0952 | 0895 | 0838 | 64.078 | 19－4024 | 421 | 4397 | 4584 | 4770 | 495 | 5143 | 5330 | 5516 | 570 | 67 |
| 68 | 0863 | 0805 | 0748 | 0691 | 0633 | 0576 | 0518 | 0460 | 0403 | 65.034 | 19.692 | 7110 | 7299 | 7488 | 7677 | 7867 | 8056 | 8245 | 843 | 862 | 68 |
| 69 | 0434 | 0376 | 031 | 0260 | 0201 | 0143 | 0085 | －026 | 9968 | 65.9909 | 19.9816 | 1008 | 0200 | 0392 | 0585 | 0777 | 0969 | 1161 | 1353 | 1545 | 69 |
| 70 | ＋006 | 9947 | 9888 | 9829 | 9770 | 9710 | 085 | 9592 | 9532 | 66.9473 | 20.2712 | 2907 | 3102 | 3297 | 3492 | 367 | 388 | 4076 | 4271 | 4465 | 70 |
| 71 | 9577 | 9517 | 9458 | 9398 | 9338 |  | 9217 | 9157 | 9097 | $67 \cdot 9037$ | $20^{.5608}$ | 5806 | 6003 | 6201 | 6399 | 6596 | 6794 | 6991 | 7189 | 738 | 71 |
| 72 | 9149 | 9088 | 9027 | 8967 | 8906 | 8845 | 8784 | 8723 | 8662 | $68 \cdot 8601$ | $20 \cdot 8504$ | 8704 | 8905 | 9105 | 9306 | 9506 | 9706 | 9907 | －10 | 030 | 72 |
| 73 | 8720 | 8659 | 8597 | 8536 | 8474 | 8412 | 8350 | 8288 | 8227 | 69.8165 | $21 \cdot 1400$ | 1603 | 1806 | 2009 | 2213 | 2416 | 2619 | 2822 | 3025 | 322 | 7 |
| 74 | 8292 | 8230 | 8167 | 8105 | 8042 | 7979 | 7917 | 7854 | 7791 | $70 \cdot 7728$ | 21.429 | 4502 | 4708 | 4914 | 5120 | 5326 | 5532 | 5737 | 594 | 614 | 74 |
| 75 | 786 | 00 | 7737 | 7674 | 7610 | 7547 | 7483 | 7420 | 7356 | $71 \cdot 7292$ | $21 \cdot 719$ | 7400 | 760 | 7818 | 8027 | 823 | 844 | 8653 | 886 |  | 75 |
| 76 | 7435 | 7371 | 7307 | 7243 | 7178 | 7114 | 7050 | 6985 | 6921 | $72 \cdot 6856$ | 22.0087 | 0299 | 0511 | 0722 | 0934 | 1145 | 135 | 1568 | 178 |  | 76 |
| 77 | 7006 | 6942 | 6877 | 6812 | 6746 | 6681 | 6616 | 6551 | 6486 | 73.6420 | 22.2983 | 3198 | 3412 | 3626 | 3841 | 4055 | 4269 | 4484 | 469 | 491 | 77 |
| 78 | 6578 | 6512 | 6446 | 6381 | 6315 | 6249 | 6183 | 6116 | 6050 | 74．5984 | $22 \cdot 5879$ | 6096 | 6313 | 6531 | 6748 | 6965 | 7182 | 7399 | 761 | 783 | 78 |
| 79 | 6149 | 6083 | 6016 | 5949 | 5883 | 5816 | 5749 | 5682 | 5615 | 75.5548 | 22.8775 | 8995 | 9215 | 9435 | 9655 | 9875 | 1094 | 0314 | 0534 | 075 | 79 |
| 80 | 5721 | 5654 | 5586 | 5518 | 5451 | 5383 | 5315 | 5248 | 5180 | 76.5112 | 23．1671 | 1894 | 2116 | 2339 | 256 | 278 | 300 | 3230 | 345 | 3675 | 80 |
| 81 | 5292 | 5224 | 5156 | 5087 | 5019 | 4950 | 4882 | 4813 | 4745 | 77＊4676 | $23^{\prime} 4567$ | 4792 | 5018 | 5243 | 5469 | 5694 | 5920 | 6145 | 6370 | 659 |  |
| 82 | 4864 | 4795 | 4726 | 4656 | 4587 | 4518 | 4448 | 4379 | 4309 | 78.4240 | $23 \cdot 7463$ | 7691 | 7919 | 8148 | 8376 | 8604 | 8832 | 9060 | 9289 | 951 | 8 |
| 83 | 4435 | 4366 | 4295 | 4225 | 4155 | 4085 | 4015 | 3944 | 3874 | 79.3804 | $24 \cdot 0359$ | 0590 | 0821 | 1052 | 1283 | 1514 | 1745 | 1976 | 2207 | 243 |  |
| 84 | 4007 | 3936 | 3865 | 3794 | 3723 | 3652 | 3581 | 3510 | 3439 | 80．3367 | $24 \cdot 3255$ | 3488 | 3722 | 3956 | 4190 | 4424 | 4657 | 4891 | 512 | 535 | 84 |
| 85 | 3579 | 350 | 3435 | 3363 | 3292 | 3220 | 3148 | 3076 | 3003 | 81．2931 | 24．6150 | 6387 | 6624 | 6860 | 7097 | 733 | 7570 | 7807 | 804 | 5329 | 析 |
| 86 | 3150 | 3078 | 3005 | 2932 | 2860 | 2787 | 2714 | 2641 | 2568 | 82.2495 | 24．9046 | 9286 | 9525 | 9765 | 4004 | 0243 | 0483 | 0722 | 096 | 120 | 86 |
| 87 | 2722 | 2648 | 2575 | 2501 | 2428 | 2354 | 2281 | 2207 | 2133 | 83．2059 | $25 \cdot 1942$ | 2184 | 2427 | 2669 | 2911 | 3153 | 3395 | 3637 | 3879 | 412 | 87 |
| 88 | 2293 | 2219 | 2145 | 2070 | 1996 | 1922 | 1847 | 1772 | 1698 | 84．1623 | $25 \cdot 4838$ | 5083 | 5328 | 5573 | 5818 | 6063 | 6308 | 6553 | 679 | 704 | 8 |
| 89 | 1865 | 1790 | 1714 | 1639 | 1564 | 1489 | 1413 | 1338 | 1262 | 85.1187 | 25.7734 | 7982 | 8229 | 8477 | 8725 | 8973 | 9220 | 9468 | 9716 | 996 | ） |
| 90 | 1436 | 1360 | 1284 | 1208 | 1132 | 1056 | 0980 | 0904 | 0827 | 86.0751 | 26.0630 | 088 | 1131 | 1382 | 1632 | 1882 | 2133 | 238 | 263 | 288 | 90 |
| 91 | 1008 | 0931 | 0854 | 0777 | 0700 | 0623 | 0546 | 0469 | 0392 | 87.0315 | 26．352 | 377 | 4032 | 4286 | 4539 | 4792 | 5046 | 5299 | 5552 |  | 91 |
| 92 | 0579 | 0502 | 0424 | 0346 | 0269 | 0191 | 0113 | ＋035 | 9957 | 87.9879 | $26^{\circ} 6422$ | 6678 | 6934 | 7190 | 7446 | 7702 | 7958 | 8214 | 84 | 872 | 92 |
| 93 | 0151 | ＋072 | 9994 | 9915 | 9837 | 9758 | 9679 | 9600 | 9521 | 88.9443 | $26^{\text {¢ } 9317 ~}$ | 9576 | 9835 | －094 | 0353 | 0612 | 0871 | 1130 | 1388 | 164 | 93 |
| 94 | 9722 | 9643 | 9564 | 9484 | 9405 | 9325 | 9246 | 9166 | 9086 | 89.9006 | $27 \cdot 2213$ | 2475 | 2737 | 2998 | 3260 | 3522 | 3783 | 4045 | 430 | 456 | 94 |
| 95 | 9294 | 9214 | 33 | 053 | 8973 | 8893 | 8812 | 8732 | 8651 | $90 \cdot 8570$ | 27－5109 | 5374 | 5638 | 5903 | 6167 | 6431 | 6696 | 6960 | 7225 | 568 | 95 |
| 96 | 8865 | 8784 | 8703 | 8622 | 8541 | 8460 | 8379 | 8297 | 8216 | 91.8134 | 27•8005 | 8272 | 8540 | 8807 | 9074 | 9341 | 9608 | 9876 | －143 | 0410 | 96 |
| 97 | 8437 | 8355 | 8273 | 8191 | 8167 | 8027 | 7945 | 7863 | 7780 | 92.7698 | 28.0901 | 1171 | 1441 | 1711 | 1981 | 2251 | 2521 | 2791 | 306 | 333 | 97 |
| 98 | 8008 | 7926 | 7843 | 7760 | 7677 | 7594 | 7511 | 7428 | 7345 | 93.7262 | 28．3797 | 4070 | 4343 | 4615 | 4888 | 516 | 5434 | 5706 | 597 | 6252 | 98 |
|  | 7580 | 7496 | 7413 | 7329 | 7245 | 7162 | 7078 | 6994 | 6910 | 94．6826 | 28.6693 | 6968 | 7244 | 7520 | 7795 | 807 | 8346 | 8622 | 8897 | 917 | 99 |
| 100 | 7151 | 7067 | 6983 | 898 | 6814 | 6729 | 6644 | 6560 | 475 | 95.63 | 28.9589 | 9867 | ＋146 | 0424 | 0702 | 0981 | 1259 | 1537 | 1815 | 2094 | 100 |
|  | $10^{\prime}$ | $9{ }^{\prime}$ | $8^{\prime}$ | $7{ }^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | ${ }^{\prime}$ | ＇ | 10 | ${ }^{\prime}$ | 碞 | ＇ | ＇ | ， | \％ |  |  |  |  |
| 73 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | INE． |  |  |  |  | 3 |

TRAVERSE TABLES．

| 17 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． 1 |  |  |  |  |  |  |  |  |  | $7^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | I |  | $3^{1}$ |  |  |  |  |  |  |  |  |  |  | $4^{1}$ |  |  |  |  |  |  |
|  | 9563 | 95 | 956 | 9560 | 9560 | 955 | ${ }^{9558}$ | 9557 | 9556 | ．955 | 2924 | 2926 | 2929 | 2932 | 2935 | 2938 | 2940 | 2943 | 946 |  |  |
|  |  | 912 | 9123 | 91 | 91 | 9118 | 9116 | 9114 | 91 | 1.911 | ． 5847 | 5853 | 5859 | 5864 | 5870 | 75 | 5881 |  |  |  |  |
|  |  | 868 | 8684 | 86 | 86 |  | 867 | 8671 |  |  | 8771 | 877 | 8788 | 8796 | 88 | 88 | 8821 |  |  |  |  |
|  |  | 8249 | 82 |  | 砣 |  |  |  |  |  | 595 | 170 | 1717 |  | 17 |  |  |  | 1784 |  |  |
|  |  |  |  |  |  | 7794 | 7790 | 7785 |  | $4 \cdot 777$ | $1 \cdot 46$ | 4632 |  |  | 467 |  | 4702 | 4716 | 4730 |  |  |
|  | 7378 | 7373 | 7368 | 7363 |  | 7353 |  | 7342 | 73 | 57332 | 17 |  | 7576 | 7592 | 7609 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 048 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 645 |  |  |  |  |  |  |  |  |  | 3545 |  |  |  |
|  | 6067 | 6060 |  |  |  |  | 60 | 6014 |  |  | $2 \cdot 6$ | 6338 | 6364 | 6389 | 6414 | 6439 | 6464 | 6489 | 6514 | 6539 |  |
| 10 | 56 | 5622 | 56 | 5605 |  | 5588 | 55 | 5571 |  | 9．5554 | 2.92 | 9265 | 9293 | 9321 | 9348 | 9376 | 9404 | 9432 |  |  |  |
| 11 | 5194 | 518 | 51 | 51 | 5156 | 5147 | 51 | 5128 | 5118 | 10 | 3.2161 | 2191 |  |  | 2283 | 2314 | 2344 | 2375 | 2406 |  | 1 |
| 12 | 4757 | 4746 | 47 | 47 | 4716 | 4705 | 4695 | 4685 | 4675 | 11.4 | $3 \cdot 5085$ | 5118 | 5151 | 5185 | 52 | 525 | 5285 | 5318 | 535 |  | 2 |
| 13 | 4320 | 430 | 429 | 42 | 42 | 42 | 4253 | 4242 | 4231 | 12.42 | 3.8008 | 44 | 8081 | 8117 | 8153 | 8189 | 8225 | 8261 | 8298 |  | 13 |
|  |  | 387 | 38 | 3847 | 38 | 38 | 3811 |  |  | $13 \cdot 37$ | 4.0932 |  | 1010 | 1049 |  | 1127 | 1166 | 1205 | 1243 |  |  |
| 15 | 3446 | 位 | 34 | 3407 | 339 | 33 | 33 | 33 | 3343 | 14 | 43 | 389 | 393 | 3981 | 40 | 40 | 4106 | 41 | 41 | 423 | 5 |
| 16 | 20 | 29 |  | 2 | 29 | 29 | 29 | 29 | 28 | 15.2 | 4.6779 | 6824 |  | 13 | 6957 |  |  | 7091 |  |  | 16 |
|  | 257 | 25 | 2543 | 25 | 25 |  | 2485 | 24 | 24 | 16 | 4.9703 | 9750 | 9798 | 98 |  |  |  | 1034 |  |  |  |
|  |  |  |  |  |  |  |  |  | 2012 |  |  | 2677 | 2727 | 277 |  | 287 |  |  |  |  | 18 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9 |
| 20 | 1261 |  |  |  |  |  |  |  | 1124 |  |  |  | 8586 |  |  | 875 | 8808 | 8864 | 8919 |  |  |
| 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 21 |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 23 |
|  |  |  |  | 98 |  |  | 983 |  | 97 |  |  | 7309 |  |  |  |  |  |  |  |  | 23 <br> 24 |
|  | 907 |  | $903$ |  | $1895$ | \| 897 | 89 | $899$ |  | 23 | 7－3093 | 31 | 32 |  |  |  | $\begin{aligned} & 0570 \\ & 3510 \end{aligned}$ |  |  |  | 24 <br> 25 <br> 28 |
| 25 | 918 |  | 8595 | 8573 |  | 8528 | 8506 | 18484 | 84 | 24 | $7 \cdot 6017$ | 6089 | 6161 | 6234 | 630 | 6378 | 6450 | 6523 | 6595 |  | 26 |
|  |  |  |  |  |  |  |  |  | 80 |  |  | 9015 |  |  |  |  |  |  |  |  | 27 |
|  |  |  |  |  |  |  | 7622 |  | 75 | $26 \cdot 7$ |  |  |  |  |  |  |  |  |  |  | 28 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 | 6891 |  |  |  |  | 6764 |  | 67 |  |  | $8 \cdot 7712$ |  | 7878 |  |  | 8129 | 8212 |  |  |  | 30 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 35 |  |  |  | 46 |  | 45 | 4528 |  |  | 33：4438 | $10 \cdot 2330$ |  |  |  |  |  |  |  |  |  |  |
| 36 |  |  |  |  | 414 |  | 408 |  |  |  |  |  |  |  | 565 | 57 | 5855 | 5955 |  |  | 36 |
|  | 383 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 |  |  |  | 32 | 3266 | 3234 | 32 | 31 | 31 |  | 11.1 | 133 |  | 促 |  |  | 1735 |  |  |  | 38 |
|  |  |  |  |  |  |  | 27 |  |  | $37^{\circ} 26$ |  | 4133 | 424 |  | 445 | 456 |  |  |  |  | 39 |
| 40 |  |  |  |  | 23 | 2351 | 2317 | 2283 | 2249 | 38. | 11.694 | 706 | 717 | 72 | 739 | 75 | 76 | 77 | 7839 |  | 0 |
| 41 | 2085 | 2050 | 2 | 19 |  |  | 1875 | ${ }^{18}$ |  | $39^{\prime}$ |  |  |  |  |  |  |  |  |  |  |  |
|  | 164 |  | 15 | 15 |  |  | 1433 | 13 |  | 40.1 |  | 2913 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 | 0337 | 029 |  | 022 |  |  | 010 |  | ＋030 | 42.99 | $13 \cdot 1567$ |  |  |  |  |  |  |  |  |  |  |
| 46 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 47 | 94 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 87 |  |  |  |  |  |  |  |  |  |  | 127 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7278 | 72 | 71 |  |  | 7057 | 70 | 69 |  | 5 | $15 \cdot 20$ | 2178 |  |  | 55 |  | 2901 |  |  |  |  |
|  |  |  | 67 |  | 66 | 66 | 657 | 65 |  | 50 |  |  |  |  |  |  |  |  |  |  | 53 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 |  | 5 |  | 58 | 57 | 57 |  |  |  |  |  | 0957 |  |  |  | 1569 | 1722 | 1875 |  |  | 55 |
|  |  |  |  |  |  | 52 | 52 |  |  |  |  |  |  |  |  |  |  | 14818 |  |  |  |
|  |  |  |  |  |  | 48. | 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 46 |  |  |  |  | 44 |  | 4310 |  |  |  |  |  |  |  |  |  | （ |  |  | 58 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2 | 28 |  | 27 |  | 26 |  | 2539 | 2486 |  | 18 | 1443 |  |  |  | 213 |  | 2 | 2650 |  | 62 |
| 6 | 24 |  |  | 181 |  | 22 | 21 | 20 | 1152 | 51 | 18.419 | 736 | 45 |  |  |  |  | 542 |  |  |  |
| 6 | 2035 |  | 1926 | 18 | 181 | 17 | 17 | 1653 | 1598 | 6115 | $18 \cdot 71$ | 729 | 74 |  |  | S00 |  |  |  |  |  |
| 65 | 1598 | 15 | 14 | 1432 | 137 | 1321 | 12 | 1210 | 115 | 62.10 | $19 \cdot 00$ | 022 | 040 | 058 | 0765 | 90 | 112 | 1307 |  | 16 |  |
| 66 | 11 |  |  |  |  | 08 | 08 | 07 |  |  |  | 314 |  |  |  |  | 4067 | 425 | 1434 |  | ${ }^{56}$ |
|  | 0724 |  |  |  |  |  |  | 03 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 70 | 9413 | 9354 | 9294 |  | 9175 | 9115 | 9055 |  | 8935 | 66.8875 | $20 \cdot 4660$ | 4855 |  | 52 | 5439 | 5634 | 5828 |  | 6217 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 853 | 847 | 847 | 83 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 73 | 81 |  |  | 7916 |  |  | 7729 |  |  |  |  | 36 | 383 |  | 424 | 44 |  | 48 |  |  |  |
|  | 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 75 | 722 | 165 | ， | 7037 |  |  | 684 | 6781 | 6716 | 71.66 | 21.927 | 948 | 9696 | 9 | 11 | 0322 |  | 07 |  |  | 75 |
|  | 673 | 6727 | 66 | 6597 | 6533 | 64 | 640 | 63 | 6273 |  | 22 | 241 | 2625 |  |  |  |  |  |  |  | 76 |
|  | ${ }^{635}$ | ${ }^{62}$ | 6224 | 6158 | ${ }_{6092}^{6052}$ | 55 | 55 | 5 | 5 | 73.57 | 22 |  |  |  | 5983 | 619 | 641 | 662 |  |  |  |
|  |  |  |  |  | 5652 | 55 | 5519 | 54 | 538 | 74.53 |  |  |  |  | 8918 | 913 | 93 | 95 |  |  | 78 |
| 80 | 548 | 保 |  | 52 |  | 51 |  |  |  |  |  |  |  |  | 185 |  |  |  |  |  |  |
| 80 | 50 | 497 |  | 483 | 4771 |  |  |  |  |  | 23 |  |  |  |  |  |  |  |  |  |  |
| 81 |  |  |  | 44 |  | 42 | 4 | ${ }^{4123}$ | 405 |  |  |  |  | 74 |  |  | 8173 | 8398 |  |  |  |
|  |  |  |  | 3960 |  | 38 | 375 | 36 |  |  |  |  |  |  |  |  | 111 | 134 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 32 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 | 285 | 278 | 2714 |  |  | 24 | 2424 | 235 | 227 | $81 \cdot 220$ | $24 \cdot 85$ | 87 | 8989 | 9225 |  |  |  | ＋171 | 0407 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 86 |
|  |  | 19 | 1837 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 90 | 0674 | 0598 | 052！ | 044 | 036 | 0291 | 0214 | 0137 | －060 | ${ }_{85}^{85.0427}$ | 26．0211 | 3385 | 0706 | 388 | 4136 | 438 | 463 | 488 | 5137 |  |  |
|  | 0237 |  | 0082 |  |  |  | 9772 | 9694 | 96 | 86 | $26^{26058}$ | 631 | 65 | 6818 |  | ${ }^{7324}$ | \％ |  |  |  |  |
|  |  | 9722 | 9644 |  | 9487 | 9408 | 9330 | 9251 | 917 | 87 | 26.88 | 92 | 94 |  | 405 | 026 | 0517 | 077 |  |  |  |
|  |  | 9284 |  | 9126 | 904 |  |  |  | 872 | 88：8 |  |  |  |  |  |  | 343 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 95 |  |  |  |  |  |  |  |  |  |  | $27 \cdot 7$ | 801 | 828 |  |  |  |  | 96 |  |  |  |
| 96 | 8053 | 797 |  |  |  | 7643 | 75 |  |  | 91 | $28^{\circ}$ |  |  |  |  | 201 |  |  |  |  |  |
|  |  | 753 |  |  |  | 72 | 711 |  | 695 | 92＇6870 | $28 \cdot 3$ |  |  |  |  |  | 5219 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 6220 | 6135 | 6049 |  | 587 |  | 5707 | 5622 |  | 29.2372 | 2650 | 2928 | 3206 | 3484 | 3762 | 4040 | 4318 | 4596 | 4874 | 100 |
|  | $6^{6}$ | $59^{\prime}$ |  | $57^{\prime}$ | $56^{\prime}$ | $55^{\circ}$ | $54^{\prime}$ |  |  | $51^{1}$ |  |  |  |  |  | 155 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

|  | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $17^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | 34 | $35^{\prime}$ | 36 | $37^{\prime}$ | 38＇ | $39^{\prime}$ | $30^{\prime}$ | 31 | $32^{\prime}$ | $33^{\prime}$ | 34 | 35 | 36 | $37^{\prime}$ | 38 |  |  |
|  | 953 | 953 | 95 | 95 | 9534 | 95 | 32 | 9531 | 9530 | 9529 | 3007 | 3010 | 3013 | 3015 | 3018 | 3021 | 3024 | 3026 | 3029 |  |  |
|  | 9074 | 90 | 907 | 90 | 96 |  |  |  |  | 905 | 6014 | 6020 | 60 | 6031 | 6036 | 60 | 6047 | 60 | 605 |  |  |
| 3 | 8612 | 860 | 860 |  | 86 | 8598 |  |  |  |  |  | 902 |  | 9046 | 9054 | 906 | 9071 | 9079 | 9088 |  |  |
| 4 | 81 | 81 | 8142 | 8138 | 8135 | 8131 | 8128 | 812 | 8121 | $3 \cdot 81$ | 2028 |  |  | 2062 | 2073 | 2084 |  | 2106 | 2117 |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |  | 5077 |  | 510 |  | 5132 | 5146 |  |  |
| 6 | 7223 | 7218 | 7213 |  |  |  |  |  | 718 |  |  | 8059 | 8076 | 8092 | 810 | 8126 | 142 |  | 8175 |  |  |
|  | 620 | 675 | 6748 |  |  | 6730 |  |  |  |  |  | 106 | 1 | 1108 |  |  | 1166 | 1185 | 1205 | 122 |  |
| 8 | 629 | 62 | 62 | 627 |  | 6262 | 625 | 624 | 624 | 7.623 |  | 407 | 41 | 41 | 41 | 41 | 419 | 421 | 4234 | 42 |  |
|  | 583 |  |  |  |  |  |  |  | 5771 |  |  | 708 | \％ |  |  | ， | 721 | 723 | 7263 | 7288 |  |
| 10 | 5372 | 5363 | 5354 | 5345 | 5337 | 5328 | 5319 | 5310 | 5301 | $9 \cdot 5293$ | 3.0071 | 0098 | 0126 | 0154 | 01 | 020 | 023 | 026 | 0292 | 0320 | 10 |
| 11 | 49 | 48 | 4890 | 4880 | 4870 | 4861 | 4851 | 4841 | 4832 | 10 |  | 3108 | 313 | 3169 | 32 | 3230 | 3261 | 3291 | 3322 | 3352 |  |
| 12 | 4446 |  | 442 |  |  |  | 4383 |  | 4362 | 11．43 |  |  | 6151 |  | 6218 |  | 6284 |  | 6351 |  |  |
|  | 39 |  | 3960 |  |  |  |  |  | 3892 |  | ， | 9128 | 9164 |  | 9236 | 92 | 9308 | 9344 | 9380 | 941 |  |
| 14 | 35 | 350 | 349 | 348 |  | 345 | 3447 | 3 | 34 | 13341 |  | 2138 | 217 | 22 | 22 | 229 | 233 | 23 | 2409 |  |  |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 53 |  |  |  |  | 15 |
| 16 | 2595 | 2581 |  |  |  |  | 251 |  | 2482 | 15.246 | 48113 | 8157 | 8202 | 8246 |  | 8335 | 3379 |  |  |  | 16 |
| 17 | 21 | 21 | 21 | 20 |  |  | 20 | 202 | 2012 | 16.1 |  | 1167 | 12 | 1 |  | 135 | 14 | 1450 | 1497 |  | 17 |
| 18 | 16 | 16 | 16 |  |  |  | 1574 |  |  | 18 |  | 417 | 422 | 42 |  | 437 | 442 | 447 | 45 | 4576 | 18 |
| 19 | 120 |  | 1173 |  |  |  | 1106 |  |  |  |  | 7187 | 724 | 7292 |  | 7398 | 7450 | 7503 | 7556 |  |  |
| 20 | 0743 | 0726 | 0708 | 0691 | 0673 | O6 | 0638 | 062 | 0603 | 19. | ， 0141 | 019 | 02 | 030 | 036 | 041 | 047 | 052 | 058 | 640 | 20 |
| 21 | 028 | 026 | 02 | 02 | 0207 | 0189 | 0170 | 0152 | 0133 |  | ． 3148 | 3206 | 326 | 3323 | 3381 | 3439 | 3498 | 355 | 3614 | 3672 | 21 |
| 22 |  |  |  |  |  |  | 9702 |  |  | 20.96 |  | 6216 | 6277 |  |  |  |  |  |  |  | 22 |
| 23 | 935 | 93 | 93 | 9294 | 9274 | 9254 | 9234 | 9214 | 91 | 21.917 | 9162 | 9226 | 929 | 9354 |  |  | 954 |  | 9673 |  | 23 |
| 24 | 88 | 88 | 88 | 882 | 8808 |  | 876 |  |  | 22.87 |  | 22 | 23 | 2369 |  | 2502 | 25 | 26 | 27 | 276 | 24 |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 |
| 26 | 7966 |  |  |  |  |  |  |  |  | 24.776 | ＇818 |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 750 | 7480 | 7456 | 743 | 7409 |  | 7361 | 733 |  |  |  | 126 | 134 |  |  |  | 1640 |  |  |  | 27 |
| 28 | 704 |  |  |  |  |  | 689 |  |  |  |  | 42 | 43 | 44 |  | 45 | 46 |  | 4819 |  | 28 |
| 29 | 657 | 65 |  |  |  |  |  | 6400 |  |  |  |  | 736 | 7446 |  | 760 | 768 | 7768 |  |  |  |
| 30 | 611 | 608 | 60 | 6036 | 601 | 598 | 59 | 531 | 5904 | 28 | ． 0212 | 0295 | 03 | 04 | 0545 | 062 | 071 | 079 | 0877 | 0960 | 30 |
| 31 | 5652 | 5625 | 5598 | 5571 | 554 | 5516 | 5489 | 5462 | 5435 | 29.540 | 9.321 | 3305 | 339 | 3477 | 3563 | 3649 | 3735 | 3821 | 3907 | 3992 | 31 |
| 32 | 518 | 5161 | 5133 |  |  |  |  |  |  |  |  | 631 | 640 |  |  |  |  |  |  |  | 32 |
| 33 | 472 | 4698 | 46 | 4640 | 4611 | 4582 | 4553 | 4524 | 449 | 31／44 | 9.923 | 93 | 941 |  |  | 969 |  |  |  |  | 33 |
| 34 | 426 | 42 | 42 | 4174 |  |  | 4085 | 4055 | 402 |  | 10.2240 | 23 | 242 |  |  | 271 | 280 |  | 2994 |  | 34 |
| 35 | 380 |  |  |  |  |  | 3617 |  |  |  | $10 \cdot 52$ | 534 |  |  |  | 5732 |  |  |  |  | 35 |
| 36 | 333 |  |  |  |  |  |  |  |  |  | 10.825 |  |  |  |  |  |  |  |  |  | 36 |
| 37 | 287 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 37 |
| 38 | 24 |  |  |  |  |  |  |  |  | 36.21 | 11 | 43 | 44 |  |  | 479 | 490 | 5006 |  |  | 38 |
| 39 | 195 | 191 |  |  |  |  |  |  |  |  | 11 | 7383 | 749 |  |  |  | 792 | 803 | ह11 | 224 |  |
| 40 | 148 | 145 | 1417 | 1382 | 1347 | 131 | 1276 | 1241 | 1206 | 38.11 | 12 | 0393 | 050 | 06 | 0726 | 083 | 碞 | 105 | 1170 | 128 | 40 |
| 41 | 1024 | 0988 | 0952 | 0916 | 0880 | 0844 | 0808 | 0772 | 0736 | 39 | 12.328 | 3403 | 351 |  |  | 3858 |  | 4085 | 4199 |  |  |
|  | 05 |  |  |  |  |  |  |  |  | 40.022 |  | 641 |  |  |  |  |  |  |  |  | 2 |
| 43 | 009 |  | ＋023 | 9985 |  | 9910 | 9872 | 9834 |  | 40 |  | 94 | 95 |  |  | 990 | －0， | 0138 | 0257 |  | 43 |
| 44 | 963 |  |  |  |  |  |  |  |  | 41 |  | 243 | 25 |  |  | 292 | 304 |  |  |  |  |
| 45 | 91 | 9133 |  |  |  |  |  |  |  | 42.8817 | 13.5318 | 5442 | 556 | 5692 | 5817 | 5942 | 606 |  | 6316 |  | 45 |
| 46 | 871 | 867 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 82 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 47 |
| 48 | 77 |  |  |  |  |  |  |  |  | $45 \cdot 74$ | 14.43 | 44 | 46 |  |  | 50 | 51 |  | 54 |  | 48 |
| 49 | 73 | 727 |  |  |  |  |  | 7020 | 69727 | $46^{\circ} 6934$ | 14.7 | 7482 | 76 |  |  | 802 | 816 | 829 | 8433 | 856 | 49 |
| 50 | 685 | 6815 |  | 6727 | 6683 | 6639 | 6595 | 551 | 650 | $47^{\circ}$ | 15. | 0492 | 063 | 07 | － | 104 | 118 | 1324 | 146 | 160 | 50 |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 593 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 708 | 7232 |  |  |  |  |
| 53 | 5470 | 54 | 53 | 53 | 52 | 52 | 51 | 51 | 50 | 50.5 | 15.93 | 9521 | 966 |  |  | 108 | 02 | 04 | 0550 |  | 53 |
| 54 | 500 |  |  | 48 | 48 |  | 47 | 46 |  | 51.4 | 16.23 |  | 268 |  |  | 313 | 32 |  |  |  | 54 |
| 55 | 45 | 4496 | 4448 | 4400 | 435 | 430 | 4255 | 4206 |  | 52.4110 | 16.5388 | 5541 | 5693 | 5846 | 5998 | 6151 | 6303 | 6456 | 6608 |  | 55 |
| 56 | 408 | 4032 |  | 3934 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 36 |  |  |  |  |  |  | 32 |  |  | 17 | 156 | 17 |  |  | 2193 | 235 |  |  | 㖪 | 57 |
| 58 | 31 |  |  |  |  |  |  | 28 |  |  | 17.4 | 457 | 473 | 48 |  | 5214 | 53 |  |  |  |  |
| 59 | 269 |  | 259 | 2538 | 2486 | 2434 | 383 | 2331 | 22 | 56 |  | 7580 | 774 |  |  | 823 |  | 8562 | 8725 | 888 |  |
| 60 | 2230 | 21 | 2125 | 2073 | 2020 | 1967 | 1914 | 1862 | 18 | 57＇175 | 18.04 | 0590 | 07 | 923 | 108 | 12 | 142 | 158 | 175 | 192 | 60 |
| 61 | 176 |  |  |  |  |  |  |  |  |  | 18 |  | 378 |  |  |  |  |  |  |  |  |
| 62 | 130 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 084 | 07 | 0731 | 067 | 06 |  | 0510 | 045 |  | 60.03 | 18.94 |  |  |  |  |  |  |  |  |  |  |
| 64 |  |  |  |  |  |  | ＋042 |  |  |  | 19.245 | 26 | 280 |  |  |  | 35 |  |  |  | 64 |
| 65 | 99 |  |  |  |  |  |  |  |  |  | 18． |  |  |  |  |  |  |  |  |  | 65 |
| 66 | 945 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 89 | 893 |  | 88 |  | 869 |  |  |  | $63 \cdot 84$ | 20 | 16 | 18 |  |  | 24 |  | 2774 |  |  |  |
| 68 | 85 |  |  |  |  |  |  | 8110 |  |  |  |  | 485 |  | 52 | 5423 | 56 |  |  |  |  |
| 69 | 806 | 8004 | 7944 |  | 78 |  |  |  |  |  |  |  |  |  |  |  | 6 |  |  |  |  |
| 70 | 7602 |  |  | 7418 |  | 7295 | 72 | 717 | 711 | 66.704 | 21. | 06 | 088 | 107 | 127 | 146 | 165 | 185 | 204 | 224 | 70 |
| 71 | 667 |  |  |  |  |  |  | 6703 |  |  | 21 | 36 |  |  |  | 4 |  |  |  |  |  |
| 72 | 667 | 66 |  |  |  |  |  |  | 570 |  |  |  | 690 |  |  |  | 730 |  |  |  |  |
| 73 | 621 | 61 | 60 | 602 | 595 | 589 | 5829 | 576 | 570 | 69 | 21 |  | 992 | ＋12 | 032 | 052 | 073 | 砣 | 113 | 13 |  |
|  | 5751 |  |  |  |  |  |  | 5296 | 5231 |  | $22 \cdot 252$ | 27 | 2933 | 313 | 33 | 354 | 3754 |  | 41 | 43 |  |
| 75 | 5288 | 52 |  |  | 5025 | 495 | 48 |  | 4761 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 482 | 47 | 4692 | ， |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
| 77 | 43 | 4295 | 4227 | 4160 | 409 | 402 | 3957 | 3889 | 382 | 73．375 | $23 \cdot 15$ | 175 | 197 | 218 | 23 | 261 | 282 |  | 325 |  |  |
| 78 | 3899 | 38 |  |  |  |  |  | 3420 | 335 | －328 |  | 4767 | 498 | 520 | S | 563 | 58 | 6065 | 砛 |  | 78 |
| 78 | 343 | 33 | 32 | 322 | 315 | 309 | 3021 | 2951 | 2882 | 75.281 |  |  |  |  |  |  | 887 |  |  |  |  |
| 80 | 2974 |  |  | 2763 |  | 2623 | 553 | 2482 | 241 | 76.234 | 24.05 | 078 | 100 | 123 | 145 | 167 | 189 | 211 | 234 | 25 | 80 |
| 81 | 251 |  |  |  |  |  |  | ， | 1942 | 77.187 | $24 \cdot 35$ | 379 | 402 | 424 | 44 |  | 49 | 5181 |  |  |  |
| 82 | 2048 | 197 | 1904 | 13 | 120 | 168 | 1616 |  | 472 |  | 2457 | 680 | 03 | 726 |  |  | 794 | 817 | 839 |  |  |
| 8 | 1585 | 1512 | 1440 | 136 | 1294 | 1221 | 1148 | 1075 | 1002 | 79. | 24.95 | 981 | －04 | 027 | S | 073 | 096 | 119 |  |  |  |
| 84 | 112 | 1 |  | d |  |  | 80 | 0606 | 533 | 80. | 2 | 282 | 305 | 329 | 3525 | 3758 | 399 | 42 | 445 |  | 84 |
| 85 | 0659 | 058 | 051 | 043 |  |  | 1480 | 060 |  | － |  |  | 607 |  | S525 |  | ， |  |  | 772 | 85 |
|  | 07 | 012 | － | 9971 | 9895 |  | 9744 | ， |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9737 | 1 | 117 |  |  | 9352 | 9276 | 9199 | 912 | 82．904 | 26．161 | 185 | 209 | 233 | 257 | 2821 |  | 330 | 354 |  |  |
|  | 927 | 9194 | 9117 | 904 | 8 |  | 808 |  |  | 857 | $26 \cdot 46$ | 4865 | 5109 | 53 | 559 | 58 | 60 | 63 | 65 |  | 88 |
| 89 |  |  | 8652 | 8574 | 8496 | 84 | 8340 | 8261 | 8183 | 84.8104 |  | 7875 | 8122 | 836 | 867 | 8862 |  |  |  |  |  |
| 90 | 8345 | 826 |  | 8109 |  | 7951 | 72 | 7792 | 7713 | 85.7634 | 27.0635 | 0885 | 1135 | 138 | 163 | 188 | 213 | 238 | 263 |  | 90 |
| 9 | 78 | 780 | 72 | 㑕 |  |  |  |  |  | 86.716 | 27 | 3895 | 414 | 440 | 4652 | 490 | 51 |  |  |  |  |
| 92 | 742 | 7339 | 725 | 7178 | 709 | 7016 | 6935 | 6854 |  |  |  | 690 | 16 | 7415 |  |  | 180 | 843 |  |  |  |
| 93 94 | 695 | 6875 6412 | 679 | 67 | 663 | 6549 | 6467 | 6386 | 6304 | 88.622 | 27.965 | 9914 | －17 | 043 | 068 | 094 | 120 | 4 | 1720 |  | 93 |
| 94 | 649 | 6412 | 632 | 62 |  | 6082 |  |  |  |  |  | 292 | 318 | 344 | 寿 |  | 422 | 448 | 474 |  | 94 |
| 95 | 60 | 5948 | 5865 | 5781 | 5698 | 5615 | 5531 | 5448 | 5364 | 90.528 | 28 | 2924 | 619 | 646 | 寿 | 698 | 20 | 751 | 777 |  |  |
|  |  |  |  |  |  | 5147 | 5063 | 4979 | 4894 | 91．4809 |  |  |  |  |  |  |  |  |  |  |  |
|  | 510 | 50 | 49 | 485 | 4765 | 4680 | 4595 | 4510 | 4424 | 92－433 | $29 \cdot 168$ | 195 | 222 | 24 | 27 | 3030 |  | 3568 |  | 410 | 97 |
| 98 99 | 4643 | 455 | 447 | 438 | 4299 | 4213 | 4127 | 457 | 5 5 | 93.386 | 2963 | 4964 | 523 | 5 |  |  | 632 | 6594 | 686 | 7138 |  |
|  | 4180 3717 | 4093 | 354 | 3920 | 3366 | 3746 | 3659 | 357 | 348 | 94.339 | 29.7699 | 7973 |  |  | 8797 | 901 | 934 |  |  | ， | 99 |
| 100 | 3717 | 3629 | 3542 | 3454 | 3366 | 3279 | 3191 | 3103 | 3015 | 95．292 | 30．0706 | 0983 | 1261 | 1538 | 1815 | 2093 | 2370 | 2647 | 2924 | 3202 | 00 |
|  | 30 | 29 | 28 | $27^{\prime}$ | 26 | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ |  |  |  |  |  | 27 | $26^{\prime}$ | $25^{\prime}$ | $24^{\prime}$ | 23 | 22 |  |  |
| 72 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $17^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $17^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\prime}$ | 41 | 4＇ | $43^{\prime}$ | $44^{\prime}$ | $45^{\prime}$ | $4{ }^{\prime}$ | 47 | 48 | $49^{\prime}$ | $40^{\prime}$ | 41 | 42 | $43^{\prime}$ | $44^{\prime}$｜ | 45＇ | 46 | $47^{\prime}$ |  |  |  |
|  | 9528 | 95 | 9527 | 9526 | 9525 | 9524 | 9523 | 9522 | 9521 | 9520 | 3035 | 3038 | 30 | 3043 | 3046 | 3049 | 3051 | 3054 | 3057 | 3060 |  |
|  | 928 | 90 | － | 905 | 9050 |  |  |  |  |  |  | 607 | 608 |  |  | 609 | 61 | 61， |  | 6119 |  |
|  | 858 | 85 | 858 | 8577 | 85 | 857 |  |  | 8564 |  |  | 91 | 91 | 912 | 913 | 9146 | －15 | 9163 | 9171 | 9179 |  |
|  | 8114 | 8110 | 8106 | 8103 | 8099 | 8096 | 8092 | 8089 |  |  | 2139 |  | 21 | 2172 | 2183 | 2195 | 22 | 22 | 2228 | 223 |  |
| 5 | 7642 | 7637 |  | 103 | 7624 |  | 7615 |  |  |  |  |  | 5202 | 52 | 5229 | 52 | 5257 | 527 | 5285 | 529 |  |
|  | 7170 | 7165 | 7160 | 7154 |  |  |  |  |  | 5712 |  | 225 | 8242 |  | 8275 | 8292 | 8308 | 8325 |  |  |  |
|  | 669 | 669 | 668 | 6680 |  |  |  | 665 | 6610 |  |  | 126 | 1 |  | 132 | 134 | 360 | 137 |  |  |  |
|  | 622 | 6220 | $62 / 3$ | 6206 | 61 | 6192 | 6185 |  | 61 | 616 | 4278 | 430 | 432 | 43 | 4367 | 438 | 4411 | 4433 | 4456 | 44 |  |
|  | 575 |  |  |  |  | 5716 | 5708 |  | 5692 |  | 2.7313 | 73 | 73 | 7388 | 7413 | 7438 | 746 | 7488 | 13 | 7538 |  |
| 10 | 5284 | 5275 | 5266 | 5257 | 48 | 5240 | 5231 | 222 | 5213 | 9.5204 | 3.0348 | 0376 | 0403 | 0431 | 0459 | 0486 | 051 | 0542 | 0570 | 0597 | 10 |
| 11 | 48 | 4802 | 47 | 4783 | 4773 | 4764 | 4754 | 4744 | 4734 | 10.472 | －3383 | 3413 | 3444 | 34 | 3505 | 3535 | 3566 | 3596 | 3626 | 3657 |  |
| 12 | 434 | 43 | 43 |  |  | 428 | 427 |  |  | 11 | 6417 | 6451 | 6484 | 65 |  | 6584 | 6617 | 6550 | 6683 |  |  |
| 13 | 386 | 38 | 38 |  | 3823 | 3811 | 3800 | 3788 | 3777 | $12 \cdot 3$ | 3 | 9488 | 9524 | 95 | 9596 | 963 | 966 | 9704 | 40 | 977 |  |
| 14 | 3397 | 3385 | 337 |  | 3348 | 333 | 3323 |  |  | 13.32 | 4.2487 |  | 25 | 26 | 2642 | 2681 | 2720 | 2759 | 2797 | 283 |  |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 573 |  | 5813 | 5854 |  | 15 |
| 16 | 2454 | 2440 | 2426 | 2412 | 2398 | 2383 | 2369 | 2355 | 2341 | 15.232 | 4.8557 | 8601 | 8645 | 8690 | 8734 | 3778 | 3823 | 8867 | 8911 |  | 16 |
| 17 | 198 | 19 | 195 | ， |  |  | 18 |  |  | 16. |  | 163 |  | 17 |  | 1827 | 1874 | 1921 | 1968 | 2015 | 17 |
| 18 |  |  |  |  |  |  | 14 |  |  | 17 | 4626 | 467 | 47 | 47 | 48 | 487 | 49 | 49 | 5025 | 507 | 18 |
| 19 | 103 | 1022 | 1006 | 0989 | 0972 | 095 | 0938 | 092 | 0905 |  |  | 77 | 7766 | 78 | 7872 | 79 | 797 | 8029 | 8082 | 813 |  |
| 20 | 056 | 0550 | 25 | 0515 | 0497 | 0479 | 0461 | 0444 | 0426 | 19.0408 | 6.0696 | 0751 | 0807 | 0862 | 0917 | 097 | 102 | 108 | 1139 | 119 | 20 |
| 21 | 0096 |  |  | 0040 | 0022 |  |  |  |  | 19.99 | 6.37 | 378 | 38 |  | 3963 | 4022 | 4080 | 4138 | 4196 | 42 | 21 |
| 2 |  |  |  |  |  |  |  |  |  | 20.94 |  |  |  |  |  |  |  |  |  |  |  |
| 23 | 915 | 91 | 911 | 9092 | 9071 | 905 | 903 | 9010 | 899 | 21.89 | 6.9800 | 98 | 99 | 99 | P055 | 01 | 01 | 02 | 0310 | 037 | 23 |
| 24 | 86 |  |  |  | 8596 | 8575 |  |  |  | 2 |  | 290 | 29 | 30 | 3101 | 316 | 323 | 33 | 3367 | 343 | 24 |
| 25 | 8210 |  |  |  |  |  |  |  |  |  | ． 5870 | 5939 |  | 6078 |  | 6216 |  |  | 6424 | 493 | 25 |
| 26 | 7738 | 7715 | 7692 |  | 7646 | 7623 | 7600 | 7577 | 7554 | 24.753 | 7.8904 | 8977 | 9049 | 9121 | 9193 | 9265 | 337 |  |  |  | 26 |
| 27 | 726 | 724 | 721 |  |  |  | 712 |  | 707 |  |  |  |  |  |  | 2313 |  |  |  |  | 27 |
| 28 | 67 |  |  |  | 6696 |  |  |  |  | $26 \cdot 657$ |  |  |  |  |  | 5362 |  | 5517 |  | 567 | 28 |
| 29 | 63 | 629 | 6272 | 46 | 6220 | 6193 | 616 | 614 | 6118 |  |  | 808 | 81 | 82 | 8330 | 8411 | 849 | 85 | 52 | 873 | 29 |
| 30 | 58 | 58 | 5798 | 5772 | 5745 | 5719 | 5692 | 5665 | 5639 | 28.56 | 9. | 1127 | 12 | 12 | 1376 | 145 | 15 | 1625 | 09 | 179 | 30 |
| 31 | 538 | 5352 | 532 |  | 5270 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 49 |  | 48 | 4823 |  |  |  |  | 468 | $30 \cdot 46$ | －711 |  |  |  |  |  |  |  |  |  |  |
| 33 | 443 | 440 | 43 | 4349 | 4320 | 429 | 426 | 4232 | 4203 | 31．417 | 10.0148 |  |  | 0422 |  | 0605 |  | 0788 | 0879 | 097 | 33 |
| 34 | 396 | 3935 |  |  |  | 381 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 35 | 349 | 3462 | 34 | 3401 | 3370 | 333 | 330 | 327 | 3245 | 33＇321 | $10^{\circ}$ | 63 | 64 | 6509 | 6606 | 670 | 6799 | 6896 | 6993 | 09 | 35 |
| 36 | 3022 | 2990 | 2958 | 292 | 2894 | 2862 | 283 | 2799 | 276 | 34：273 | 10. | 9352 | 945 | 9552 | 9651 | 9751 | 9851 | 9951 | ＋050 | 0150 | 36 |
| 37 |  |  |  |  |  | 238 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 37 |
| 38 | 20 |  | 201 |  |  | 1910 |  |  |  | 36 |  |  |  | 56 |  | 58 |  | 6059 | 6164 |  | 38 |
| 39 | 16 | 157 |  |  | 1469 | 143 |  |  |  |  |  |  |  |  |  | 889 | 90 | 91 | 9221 |  |  |
| 40 | 13 | 1100 | 1065 | 1029 | 0994 | 0958 | 0923 |  | 0852 | 38.0816 | $12 \cdot 1392$ | 1502 | 1613 | 1724 | 1835 | 1946 | 2057 | 2167 | 2278 | 238 | 40 |
| 41 | 0664 |  |  |  |  |  |  |  |  | 39．033 |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 01 |  | 01 |  |  |  |  |  |  |  |  | 757 |  |  |  |  |  |  |  |  | 42 |
| 43 | 9720 |  |  |  |  |  |  |  |  | 40.937 |  |  |  |  |  | 10 | 12 |  | 14， | 156 | 43 |
| 44 | 9249 | 9210 |  |  |  |  |  |  | 8937 | 41. |  |  |  |  | 4018 | 414 | 426 | 4384 | 450 | 4628 | 44 |
| 45 | 8777 |  | 86 |  | 8618 |  | 8538 | 8498 | 8458 | 42 | 13 |  | 68 |  |  |  | 7314 | 743 | 756 | 768 | 45 |
| 46 | 8306 |  | 822 |  |  |  |  |  |  |  |  |  |  |  | ＋110 |  |  |  |  |  | 46 |
| 47 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 | 73 | 732 | 72 |  | 7193 |  | 710 |  |  |  |  |  |  |  |  |  | 64 | 660 | 6734 |  | 48 |
| 49 | 68 |  | 68 |  |  |  |  |  |  | 46 |  |  |  |  | 9248 | 938 |  | 965 | 979 | 992 |  |
| 50 | 6419 | 6375 | 6331 | 6287 | 6242 | 6198 | 6154 | 6109 | 6065 | 47－6020 | 15．1739 | 1878 | 2017 | 2155 | 29 | 243 | 257 | 270 | 2848 | 298 | 50 |
| 51 | 5947 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 52 |
| 53 |  |  |  |  | 48 |  | 4723 | 467 | 4629 | 50 |  |  |  |  |  | 1578 |  | 187 | 2019 |  |  |
| 54 | 453 | 448 | 443 |  | 43 |  | 42 | 41 | 4150 |  |  | 40 |  | 43 | 447 | 46 | 47 | 4926 |  | 522 |  |
| 55 | 4061 | 401 | 396 | 3915 | 38 | 3818 |  | 372 |  | －3 | 16.6913 |  |  | 737 | 752 | 767 | 782 | 7980 | 1132 | 328 |  |
| 56 | 3589 |  |  |  |  |  |  |  |  | 53.31 | 16.9948 |  |  |  |  |  |  |  |  |  | 56 |
|  | 3118 |  |  |  |  |  |  |  |  | 54.26 |  |  |  |  | 3615 | 37 |  | 408 |  | 40 |  |
| 58 | 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 17－9052 |  |  |  |  |  |  |  | 0360 |  |  |
| 60 | 1703 | 165 | 1597 |  | 1491 | 1437 | 1384 | 1331 | 1278 | 57．122 | 18.208 | 225 | 242 | 258 | 275 | 291 | 308 | 325 | 3417 | 358 |  |
|  | 123 |  | 112 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 02 |  |  |  |  |  |  |  |  | 59.97 | 19 |  |  |  |  |  |  | 2414 | 2588 | 76 |  |
| 64 | 9816 |  |  |  |  |  |  |  |  |  | 19. |  |  |  |  |  |  |  |  |  |  |
| 65 |  |  |  |  |  |  |  |  |  |  | 19 |  |  |  |  |  |  |  |  |  |  |
| 66 | 887 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 840 |  |  | 8224 |  | 81 | 8046 |  | 7927 | 63＇78 | $20 \cdot 33$ |  |  |  |  | 4210 |  | 46 | 4816 |  |  |
|  | 793 |  |  |  |  |  |  |  |  |  | 20.63 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 6969 |  |  |  |  |  |  |  |  | 0739 | 硣 | 112 |  |
| 70 | 6987 | 6925 | 6863 | 6801 | 6739 | 667 | 661 | 6553 | 6491 | 66.6 | 21.24 | 262 | 2823 | 301 | 32 |  | 35 | 3793 | 3987 | 41 |  |
| 7 | 65 | 645 | 6390 |  |  |  | 6138 | 6075 |  | 59 |  |  |  | 6060 |  |  |  |  | 7044 | 72 |  |
|  | 60 |  |  |  |  |  |  |  |  | 68.54 |  |  |  | 9103 |  |  |  |  |  |  |  |
|  | 557 |  | 544 | 5378 | 5314 | 52 | 5184 | 5119 | 5054 | 69＊49 | 22．15 | 17 | 194 | 2146 | 234 | 25 | 27 | 295 | 315 | 336 | 73 |
| 74 | 51 | 503 | 4970 | 04 |  |  | 4707 | 4642 | 4576 |  |  |  | 49 | 51 | 5395 |  |  |  | 621 |  | 7 |
| 75 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 17 |  |  |  |
| 77 | 368 | 36 | 35 | 3481 | 3413 | 33 | 327 | 3208 | 314 | $73 \cdot 30$ | 2336 |  | 4105 | 43 | 453 | 47 |  |  | 5385 |  |  |
|  | 321 |  |  |  |  |  |  |  | 析 | 74．259 |  |  | 146 |  | 5 |  |  | 220 |  |  |  |
|  | 274 | 26 | 2603 | 2533 | 2463 | 239 | 2323 | 2252 | 2182 | 75.2112 | 23.9748 | 996 | －186 | 0405 | 0624 | 084 | 1062 | 1280 | 1498 | 171 |  |
| 80 | 227 | 2200 | 2129 | 2058 | 1988 | 191 | 1846 | 1775 | 1704 | 76.1632 | 24.2783 | 300 | 3226 | 3448 | 367 | 389 | 411 | 433 | 455 | 477 |  |
|  | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1727 |  |  |  | 1037 | 0965 |  | 031 | O267 | 78．1183 | 24 | ， | 23 | 953 | 9762 | 9038 | ＋216 | 0443 | 6727 |  |  |
| 83 | 085 | 0782 | 070 | 0636 | 0562 | 048 | 0415 | 0341 | 026 | 79.01 | 25. | 21 | 23 | 2577 | 280 | 303 | 32 | 34 | 372 | 395 |  |
|  | 0384 |  | 源 |  |  |  |  | 析 | 矿 | － | 25．7937 | 515 | 538 | 56 | 5853 | 6086 | 6319 | 6551 | 6784 | 位 |  |
| 85 | 99 | 983 |  |  | 9612 | 9536 | 46 | 386 | 310 | 80.9234 | $25 \cdot 795$ | 819 | 8428 | 866 | 8899 | 913 | 93 | 960 | 9841 | － 07 |  |
|  | 944 | 9365 | 2016 |  | 9137 | 906 | 84 | 808 | 831 | 81.87 | 26.099 | 123 | 1468 | 17 | 1945 | 21 | 2422 | 2660 | 289 | 1 |  |
| 87 | 896 | 8892 | 16 |  | 8661 | 858 | 㖪 | 8430 | 8353 |  |  | 42 | 4509 | 4750 | 4991 | 5232 | 547 | 左 | ， |  |  |
|  | 849 | 8420 |  | 8264 | 8186 | 8108 | 8030 | 7952 | 7874 | 83.779 |  |  |  | 仡 | 8037 |  | 8524 | 102 | 201 | 23 |  |
|  | 802 |  |  |  |  | 7632 | 7553 | 7474 | 7395 |  |  | 03 | 0589 | 083 | 1083 | 132 | 157 | 1822 | 2069 | 231 |  |
| 90 | 755 | 7475 | 7395 | 7316 | 7236 | 7156 |  |  | 6916 |  | $27 \cdot 3131$ | 3380 | 3630 | 3879 | 12 | 4378 | 4627 | 4876 | 5126 | 537 |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 64 | 9670 | 砣 | 17 | 位 |  |  | 1 |  |  |
| 92 | 6611 | 653 | 644 | 6367 | 6286 | 6204 | 6123 | 60 | 59 | 87－587 | 27.920 | 94 | 97 | 99 | 122 | 047 | 07 | 0985 | 124 | 14 |  |
|  | 6140 | 685 | 597 | 989 | 5810 | 5728 | 5646 | 5563 | 5480 | 88.539 | $28 \cdot 2235$ | 2493 | 2751 | 3008 | 3266 | 352 | 378 | 4039 | 429 | 455 |  |
|  | 519 | 5585 | 5502 | 5419 | 53 | 5252 | 5169 | 5085 |  | 89．4918 | $28 \cdot 527$ | 553 | 579 | 605 | 631 | 65 | 683 | 7093 | 7354 | 761 |  |
| 95 | 51 | 5112 | 5028 |  | 486 | 4776 | 692 | 4607 | 4523 | 90．4438 | 28.830 |  | 8831 | 909 | 9358 | 962 | 9884 | 1 | 041 | 067 |  |
|  | 47 |  |  | 4470 |  | 00 | 215 | 4130 | 4044 | 91／39 | $29 \cdot 1$ |  | 1872 | 2138 | 2404 | 2670 | 2936 | 3202 | 346 |  |  |
|  | 4253 | 67 |  | 3996 | 10 | 3824 | 3738 | 3652 | 析 | 923479 | $29 \cdot 4374$ | 4643 | 4912 | 5181 | 5450 | 5718 | 5987 | 2256 | 6524 | 硣 |  |
|  | 378 |  |  | 352 | 343 | 3348 | 3261 | 31 | 3087 | $93 \cdot 3000$ | 29.7409 | 76 | 79 | 822 | 848 | 87 | 90 | 93 | 9581 | 985 |  |
|  | 310 | 222 | 3 | 247 | 60 | 72 | 278 | 析 | 608 | 94.2520 | 30.0444 | 0718 | 9993 | 267 | 1541 | 1816 | 2090 | 源 | 2638 |  |  |
| 100 | 2838 | 50 | 662 | 2573 | 2484 | 2396 | 2307 | 2218 | 2129 | 95.2040 | 30：3479 | 3756 | 4033 | 4310 | 4587 | 4864 | 5141 | 5418 | 5695 | 5972 | 100 |
|  | $20^{\prime}$ | 19 | 18 | 17 | $16^{\prime}$ | $15^{\prime}$ | 14 |  | $12^{\prime}$ | 11 |  |  |  | $17^{\prime}$ | $16^{\prime}$ | 15 | ${ }^{\prime}$ | 13 |  | $11^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $17^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $17^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | $51^{\prime}$ | 52＇ | 53 | 54 | 55 | $56^{\prime}$ | $57^{\prime}$ | 58 | 59 | $50^{\prime}$ | 51 | $52^{\prime}$ | 53 | $54^{\prime}$ | 55＇ |  |  | 58 |  |  |
|  | 9520 | 19519 | 9518 | 9517 | 951 | 9515 | 9514 | 9513 | 9512 | 951I | ${ }^{3062}$ | 3065 | 3068 | 3071 | 3074 | 3076 | 3079 | 082 | 3085 | 3087 |  |
|  | 9039 | 9037 | 9035 | 9034 | 90 |  |  | 902 |  | $1 \cdot 9023$ |  | 6131 | 613 | 6142 | 6147 |  |  | 6164 |  |  |  |
|  | 38559 | 855 | 855 | 855 | 8548 | 8545 | 8542 | 8540 | 85 | $2 \cdot 8$ |  | 9196 |  | 9212 |  |  | 9237 | 9246 |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 3．804 | 2250 | 2261 | 227 | 2283 | 2294 | 2305 | 2316 | 232 |  | 2350 |  |
|  | 57598 | 7593 | 7589 | 7584 |  | 7575 | 75 | 7566 | 7562 | 4.75 | 1.53 | 5326 | ${ }_{5340}$ | 5354 | 5368 | 5382 | 5396 | 5409 | 5423 | 5437 |  |
|  | 717 | 7112 |  | 7101 | 70 | 17090 | 7085 | 7080 | 707 | $5 \cdot 706$ | 1837 | 8392 | 8408 | 8425 | 8441 | 8458 |  | 8491 |  | 85 |  |
|  |  |  |  | 6618 | 6612 | 6605 |  | 6593 |  |  |  | 1457 | 147 |  | 1515 | 1534 | 1554 | 1573 | 1592 | 16 |  |
|  | 6156 | 614 | 6142 | 613 | 6128 | 6120 | 6113 | 6106 | 60 | 7.60 | 2.4500 | 4522 | 4544 | 4566 | 4589 | 4611 | 4633 | 4655 | 4677 | 469 |  |
|  | 5676 | 566 | 5660 | 565 | 5643 | 5635 | 5627 | 5619 | 5611 | 8.5603 | 2.7562 | 7587 | 7612 | 7637 | 7662 | 7687 | 7712 | 7737 | 7762 | 7787 |  |
|  | 105195 | 保 | 5177 | 5168 | 5159 | 5151 | 5142 | 5133 | 5124 | 9．5115 | 3.0625 | 0653 | 0680 | 0708 | 10736 | 0763 | 0791 | 0819 | 0846 | 0874 |  |
|  | 114715 | 4705 | 4695 | 4685 | 4675 | 4666 |  | 464 | 4636 | $10^{\text {P }} 462$ | 3．3687 | 3718 | 3748 | 咗 |  | 3840 | 387 | 3901 | 3931 | 3961 | 1 |
|  | 124234 | 4223 | 4213 | 4202 | 4191 | 4181 | 4170 | 4159 | 4148 | 11.4138 | 3.6750 | 6783 | 6816 | 6850 | 6883 | 6916 | 6949 |  |  |  |  |
|  | 133754 | 3742 | 37 | 371 | 370 | 3696 | 36 |  |  | $12 \cdot 36$ | 3.9812 | 9848 | 9884 |  | 9956 | 999 | ．028 |  | 0100 | 013 | 13 |
|  | 14322 | 3261 |  | 3236 | 3223 | 3211 | 3198 | 3186 | 3173 |  | 42875 | 2914 | 295 | 2991 | 3030 | 3069 | 3107 | 314 | 3185 | 32 | 14 |
|  | 152793 | 2779 | 2766 |  |  |  |  |  | 268 | 14 | 4.59 | 597 | 602 | 6062 | 6103 | 6145 | 618 |  | 6270 | 631 | 15 |
|  | 16 | 2298 | 2284 | 2269 | 225 | 2241 | 2226 | 2212 | 2198 | 15 | $4 \cdot 900$ | 190 | 9088 | 913 | 917 | 922 | 9266 | 9310 | 9354 | 9398 | 16 |
|  | 17 | 181 |  |  |  | 1756 |  |  | 1710 |  |  |  | 215 |  |  |  | 2345 | 2392 | 2439 |  | 17 |
|  | 181351 | 1335 | 1319 | 1303 | 1287 | 127 | 1255 | 123 | 1222 | 17．1206 | 5.5125 | 5175 | 522 | 5274 | 5324 | 5374 | 5424 | 5474 | 5523 | 5573 | 18 |
|  | 190871 | 0854 |  | 0820 |  | 0786 | 0769 | 0752 | 0735 | 18.0718 | 5.8187 | 8240 | 8293 | 8345 | 8398 | 8450 | 8503 | 8556 | 8608 |  | 19 |
|  | 20.0390 | 0372 | 0355 | 0337 | 03 | 0301 | 0283 | 0265 | 0247 | 19.0229 | $6 \cdot 1250$ | 1305 | 1361 | 1416 | 1471 | 1527 | 158 | 163 | 169 | 174 | 20 |
|  | 21.9910 | 9891 | 987 | 985 | 98 | 9816 | 979 | 9778 | 9760 | 19.9741 | 6.4312 | ${ }^{4370}$ | 442 | 4487 | 4545 | 4603 | 4661 |  | 4777 |  | 21 |
|  | 9429 | 9410 | 9390 | 937 | 9351 | 9331 | 9311 | 9292 | 9272 | $20 \cdot 9252$ | 6.73 | 7436 | 749 | 7558 | 7618 |  | 7740 |  |  |  |  |
|  | 8949 | 892 | 89 | 88 | ${ }^{8867}$ | 8846 | 8826 | 88 | 8784 | 21.8764 | 7.043 | 050 | 056 | 0628 | 069 | 0756 | 0819 | 08 | 09 | 10 | 23 |
|  | 24.8468 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
| 25 | 25 | 796 |  | 792 | 7899 | 7876 | 7854 |  | 7809 | 23.77 |  | 66 | 67 | 6770 | 68 |  | 6978 |  |  |  | 25 |
| 26 | 267507 | 748 | 7461 |  |  |  |  |  | 732 | 24 | 7.96 |  |  |  | 991 | 99 | ＊057 | 0129 |  | 02 | 26 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3210 | 328 |  | 27 |
| 28 | 6546 | 6521 | 6496 | 64 | 6446 | 6421 | 6396 | 6371 | 6346 | $26 \cdot 632$ | 8.57 | 5827 | 5905 | 5982 | 6060 | 6137 | 6215 | 2 | 63 |  | 28 |
|  |  | 6040 | 6014 |  |  | 5936 | 5910 | 58 | 5858 | 27. | 8.8812 | 8893 | 8973 |  | 9133 | 92 | 9294 | 9374 | 945 |  | 29 |
| 30 | 305585 | 5559 | 5532 | 5505 | 5478 | 5452 | 5425 | 5398 | 5371 | 28.5344 | $9 \cdot 1875$ | 1958 | 2041 | 212 | 220 | 229 | 237 | 245 | 25 | 2622 | 30 |
| 31 | 3151 | 5077 | 5050 | 502 | 4994 | 496 | 4939 | 4911 | 4883 | 29.485 | 9．4937 | 5023 | 5109 |  | 52 | 53 |  | 55 |  |  |  |
| $32$ | 46 | 4596 | 4567 | 4539 | 4510 | 4482 | 4453 | 4424 | 4396 | 30－436 | 9.8000 | 8088 | 8177 | 8266 | 835 | 84 | 8531 | 862 |  |  |  |
| 33 | 41 | 4115 | 408 | 40 | 4026 |  | 396 | 39 | 3908 | 31.387 | $10 \cdot 10$ | 1154 | 1245 | 1336 | 142 | 15 | 1610 | 170 | 179 | 18 | 33 |
| 34 |  |  |  |  |  | 351 |  |  | 3420 |  |  | 4219 | 4313 | 440 | 450 | 45 | 468 | 478 | 48 | 497 |  |
| 35 | 35 | 3152 | 3121 | 3089 | 3058 | 3027 | 2995 |  |  | $33^{2901}$ | 10.7 | 7284 | 7381 |  | 7575 | 7672 |  | 7865 | 7962 |  | 35 |
| 36 | 362703 | 2670 | 2638 |  | 2574 | 25 | 2510 | 2477 | 2445 | 34.241 | 11. | 03 | 0449 | 0549 | 06 | 0748 | 0848 | 0947 | 1047 |  | 36 |
| 37 | 2222 | 2189 | 2156 | 2123 | 2090 | 20 | 2024 | 1991 | 1957 |  | 11.33 | 3415 | 35 | 2620 | 3722 | 382 | 392 | 402 | 413 |  | 37 |
| 38 | 38 | 1708 |  | 16 | 160 | 1572 | 1538 | 1504 | 1470 | 36.1436 | 11.6375 | 6480 | 6585 | 6690 | 6796 | 690 | 700 | 711 |  |  | 38 |
|  | 391261 | 1226 | 1192 | 115 | 1122 | 1087 | 105 | 101 | 0982 |  | 11.9437 | 9545 | 9653 | 9761 | 9869 | 997 | 408 | 019 | 03 | 04 | 39 |
| 40 | 00781 | 475 | 0709 | 0674 | 0638 | 0602 | 0566 | 53 | 0494 | 38.045 | 12．2500 | 2610 | 272 | 2832 | 2943 | 305 | 316 | 327 | 338 | 34 | 40 |
| 41 | 10300 | 0264 | 0227 | 0190 | 0154 | 0117 | 0080 | 0044 | ${ }^{0007}$ | 38．9970 | $\frac{12.55}{}$ |  | 578 | 5903 | 60 |  |  | 63 |  |  |  |
| 42 |  |  | 9745 |  | 9670 | 9632 | 9594 | 9557 | 9519 | 39.9481 | $12 \cdot 86$ |  | 885 | 993 |  | 2 | 9322 |  | 95 |  | 42 |
| 43 | 43 | $930$ |  | 922 |  |  |  |  |  |  |  |  |  |  |  | 22 |  |  | 26 |  | 43 |
| 44 | 4488 | 881 | 87 | 87 |  | 8662 | 8623 | 8583 | 8544 |  |  | 487 |  |  |  |  | 5480 | 56 | 57 |  | 44 |
| 45 | 5837 | 8338 | 82 | 8258 | 8217 | 8177 | 8137 | 8097 | 8056 | 42.8016 | 13.7812 | 793 | 8061 | 8186 | 8310 | 843 | 1856 | 18684 |  | 8933 | 45 |
| 46 | 6789 | 7857 |  | 7775 | 773 | 769 |  |  | 756 |  | 14. | 1002 | 112 |  | 1384 | 1511 | 1639 | 1766 | 189 | 202 | 46 |
| 47 | 7417 | 7375 | 7333 | 729 | 72 | 72 | 7165 | 7123 | 7081 |  | 14.39 | 4067 | 4197 | 4328 | 4458 | 4588 | 4718 | 4848 | 497 |  | 47 |
| 48 | 8 | 6894 | 6851 | 688 | 6765 | 6722 | 667 | 6636 | 6593 | 45.65 | 14.7000 | 7133 | 7265 | 739 | 7531 | 766 | 7797 | 7930 | 8063 | 81 | 48 |
|  | 4964 | 6413 | 636 | 63 | 6281 | 6237 | 6194 | 6150 | 6106 | 46．6062 | 15.0062 | 0198 | 0333 | 0469 | 0605 | 074 | 0876 | 1012 | 11 | 12 | 49 |
| 50 | 5597 | 5931 | 5887 |  | 579 | 5753 |  | 5663 | 5618 | $47 \cdot 5573$ | $15 \cdot 3125$ | 3263 | 3402 | 3540 | 3678 | 3817 | 3955 | 4093 | 423 | 437 | 50 |
| 51 | 15495 | 5450 | 5404 | 53 | $53 / 3$ | 5268 | 5222 | 5176 | 5130 | 48.5 | 15.6187 | 6328 | 6470 | 6611 | 675 | 689 | 7034 | 717 |  |  |  |
| 52 | 5250 | 49 |  | 48 | 4829 | 4783 | 4736 | 46 | 4643 | 49 | $15 \cdot 92$ | 9394 | 9538 | 9681 | 98 | 99 | －113 | 025 |  |  |  |
| 53 | 534534 | 4487 | 4440 | 43 | 4345 | 4298 | 4250 | 4203 | 4155 |  |  | 2459 | 260 | 2752 | 289 | 3046 | 3192 | 3339 | 34 | 36 | 53 |
| 54 |  | 400 |  |  |  | 3813 |  | 37 |  |  | 16.53 | 5524 | 5674 | 58 | 5973 | 6122 | 6272 | 6421 |  |  | 54 |
| 55 | 53573 | 3524 | 347 | 3426 | 3377 | 3328 | 3278 | 32 | 3180 | 52．3131 | $16^{1784}$ | 858 | 8742 | 8894 | 904 | 919 | 935 | 950 | 9655 | 9807 | 55 |
| 56 | 563093 | 3043 | 2993 | 2943 | 2893 | 2843 | 2793 | 2742 | 2692 |  | $\mid 17 \cdot 1500$ | 1655 | 1810 | 1965 | 2120 | 2275 | 2430 | 2585 | 2740 | 2895 | 56 |
|  | 72612 | 2562 | 2511 | 2460 | 24 | 2358 | 2307 | 2256 | 2205 | 54．2153 | 17•4562 | 4720 | 4878 | 5035 | 5193 | 5351 | 5509 | 5667 | 5824 |  |  |
| 58 | 213 | 208 | 202 | 1977 | 19 | 1873 | 1821 | 1769 | 1717 | 55．163 | 17.76 | 7785 | 7946 | 810 | ${ }^{263}$ | 842 | 858 | 874 | 89 |  | 58 |
| 59 | 59165 | 1599 | 154 |  |  |  |  | 1282 | 122 |  |  |  |  |  |  |  |  |  |  |  | 59 |
| 60 | 01117 | 1117 | 1064 | 1010 | 0957 | 09 | 0849 | 0795 | 0742 | 57.068 | 18．3750 | 391 | 4082 | 4248 | 44 | 458 | 474 | 4912 | 5078 |  | 60 |
| 61 | 1 | 0636 | 0582 |  | 04 |  |  | 03 |  |  |  |  | 715 | 7319 |  | 7656 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 62 |
| 63 | 63.97 | 967 | 96 |  | 95 | 9448 | 939 | 9335 | 927 | 59 | 19.29 | 311 | 3286 | 3460 | 3635 | 380 | 3983 | 4158 | 433 | 45 |  |
| 64 | 64.92 | 91 | 91 |  |  | 89 | 8906 | 8849 | 8791 | $60 \cdot 8$ | 19.592 | 6177 | 6354 | 6531 | 6708 | 6885 | 7063 | 7240 |  |  | 64 |
| 65 | 55876 | 8710 | 8653 | 8594 | 8536 | 8478 | 8420 | 8362 | 8303 | 61：8245 | 19.9062 | 9242 | 9422 | 9602 | 978 | 996 | 142 | 032 | 050 |  | 65 |
| 65 | 658288 | 8229 | 817 | 81 | 8052 | 7993 | 7934 | 7875 | 7816 | ${ }^{62 \cdot 7757}$ | 20．2124 | 2307 | 2490 | 2673 | 2855 | 3038 | 1322 | 3403 | 3586 |  | 66 |
| 67 | 780 | 774 | 76 | 7628 | 75 | 7508 | 7448 | 7388 | 7328 | 63.7268 | 20 | 5372 | 5558 | 5743 |  | 611 | 6300 | 6485 | 66t |  | 67 |
| 68 | 68.732 | 72 | 72 | 71 | 70 | 7023 | 69 | 6902 | 6841 | 64：6780 | $20 \cdot 8249$ | 84 | 86 | 8814 | 900 | 919 | 9379 | 9567 | 9755 |  | 68 |
| 69 | 69 |  |  |  |  |  |  |  | 635 |  |  |  | 169 | 188 | 207 | 231 | 245 |  |  |  | 69 |
| 70 | 0636 | 6304 | 6241 | 6179 | 6116 | 6054 | 5991 | 5928 | 5865 |  | $\underline{21 \cdot 437}$ | 456 | 476 | 495 |  | 534 | 5537 |  | 5925 |  | 70 |
| 71 | 7158 | 5822 |  | 5695 | 5632 | 556 | 55 | 5441 | 537 |  |  |  | 783 | 8027 | 822 | 842 | 86 |  |  |  |  |
|  |  |  | 527 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 72 |
| 73 | 492 | 485 | 4794 | 47 | 46 | 45 | 45 | 4468 | 440 | 69.43 | $22 \cdot 35$ | 37 |  | 41 | 43 | 45 | 47 | 4976 |  |  | 73 |
| 74 | ${ }^{4}$ | 4378 | 4312 | 42 | 418 | 4114 | 4047 | 3981 |  |  | 22.624 | 6829 | 7034 | 7239 |  |  | 7854 |  | 8263 |  | 74 |
|  | 753964 | 3897 | 3830 | 3763 | 369 | 3629 | 3562 | 3494 | 3427 | $71 \cdot 3360$ | $22 \cdot 9687$ | 9895 | 1102 | ， | 矿 | 072 | － | 14 | 1348 | 1555 | 75 |
|  | 763483 | 3415 | 3348 | 32 | 321 | 3144 | 3076 | 3008 | 2939 | 72.2871 | 23.2749 | 2960 | 3170 | 3381 | 3591 | 3801 | 4012 | 422 | 4432 |  | 76 |
|  | 300 | 2934 | 286 | 27 | 2728 | 2659 | 25 | 2521 | 245 | 73＇23 | $23 \cdot 58$ | 60 | 6238 | 645 | 664 | 687 | 7091 |  | 7517 |  | 77 |
|  | 78 |  |  |  |  | 2174 |  | 203 | 196 |  |  |  |  | 9522 | 973 | 995 | －170 |  |  |  | 78 |
| 78 | 79 | 1492 |  |  |  | 168 | 1618 |  | 147 |  |  | 215 | 5442 | 25 |  | 303 | 32 |  | 677 |  | 79 <br> 80 |
|  | ${ }^{81}$ |  |  |  |  | 0719 |  |  |  |  |  |  | 85410 | 8735 | 895 | 9183 |  | 9613 | 985 |  |  |
|  | 82060 | 052 | 0454 | 038 | 03 | 0234 | 016 | 0087 | 101 | $77 \cdot 9$ |  | 135 | 1578 | 1805 | 2032 | 22 | 248 | 27 | 29 | 31 | 82 |
|  | 830120 | 0 |  | 9898 | 98 |  |  |  |  | 78.9452 |  | 44 | 46 | 487 |  |  |  | 579 | 602 | 625 | 83 |
| 84 | 34 | 9564 | 94 | 9414 | 9339 | 9264 | 位 |  | 9038 | 79.8963 | $25 \cdot 7249$ | 7482 | 7715 | 9 | 8180 | 84 | 864 | 887 | 910 |  | 84 |
|  | 859159 | 908 | 90 | 8931 | 8855 | 8779 | 8703 | 8627 | 8551 | 80．8474 | $26^{\circ} 0312$ | 0547 | 0783 | 1018 | 1253 | 1488 | 172 | 1959 | 219 | 24 | 5 |
|  | ${ }^{86} 8678$ | 8602 | ${ }^{8525}$ | ${ }^{8448}$ | 8371 | ${ }^{8294}$ | ${ }_{7717}^{8217}$ | 8140 | 8063 | 81．7986 | 26•3374 | 3612 | 3851 | 4089 | 4327 | 4565 | 480 | 504 | 527 |  |  |
|  | 878198 | 8120 | 80 | 7965 | 7887 | 7809 | 7731 | 7653 | 7575 | 82.7497 | $26^{\circ} 64$ | 667 | 691 | 7159 | 7400 | 764 | 78 | 81 | 8363 |  | 87 |
|  | 7717 | 7639 | 756 | 74 | 7403 | 7324 | 7246 | 7167 | 7088 | 837700 | $26 \cdot 94$ | 97 | 99 | ＋230 | 0474 | 071 | 09 | 120 | 14 | 167 |  |
|  | 89 |  |  |  |  | 6839 | 627 |  |  | 84．65 |  | 280 | 30 | 637 | 354 | 379 | 711 |  | 4533 |  | 89 |
|  | 90 | 667 | 6596 | 6515 | 6435 | 6355 | 627 | 6193 | 6112 | 85．6032 | $27 \cdot 5624$ | 5873 | 61 | 6372 |  | 6870 | 7119 |  | 761 |  |  |
|  | 91627 | 6195 | 6114 | 6032 |  | ${ }^{5870}$ | 5788 | 5706 | 5625 | 86．55 | $27^{-8687}$ |  | 919 | 9443 | 9695 | 9946 | ＋19 |  |  |  | 91 |
|  | 92579 | 5713 |  | 5549 | 5467 | 5385 | 5302 | 5220 | 5137 | $87 \cdot 5$ | 28.17 | 200 | 225 | 2513 | 2768 | 3023 | 327 | 35 | 37 |  | 92 |
|  | 9353 | 5232 |  |  |  |  | 48 | 473 | 4650 |  |  | 50 |  |  | 5842 | 6099 |  |  |  |  |  |
|  | 94 |  |  | 4583 |  | 44 | 4330 |  |  |  |  |  |  |  |  |  |  |  |  | ＋216 |  |
|  | 954354 | 4269 | 4184 | 100 | 015 | 3930 | 3845 | 3760 | 3674 | 90．3589 | 29.0937 | 1200. | 146 | 1726 | 1989 | 2252 | 2515 | 277 | 304 | 3303 | 95 |
|  | 963873 | 3788 | 3702 | 316 | 353 | 3445 | 3359 | 3273 | 3187 | 91.310 |  | 4265 | 453 | 4797 | 5062 | 5328 | 5594 | 5859 | 612 | 6391 | 96 |
|  |  | 3306 | 3220 | 3133 | 3047 | 2475 | ${ }^{2873}$ | 2786 | 2699 | 92．2612 | ${ }^{29} 70$ | 7330 |  | 7867 | 8136 | 8404 | ${ }^{3673}$ | 8941 | 9210 | 9478 |  |
|  | 98.29 | 28 | 2738 |  |  | 2475 |  | 2299 | 2211 | 93．2123 | 30．0124 | 0396 | ${ }^{0667}$ | 093 | 1209 | 1481 | 1752 | 2023 | 2294 |  |  |
|  | 243 | 234 |  |  |  |  | 1901 | 1813 | 1224 |  | 3 | 346 | 3735 | － | 4283 | 4557 | 4831 | 5105 | 5379 |  | 99 |
|  | 1951 | 1862 | 1773 | 1684 | 1594 | 1505 | 1415 | 1326 | 1236 | 95．1／46 | 30．6249 | 6526 | 6803 | 7080 | 7357 | 7633 | 7910 | 8187 | 846 | 8740 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7{ }^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{1}$ | $3^{\prime}$ | $2^{\prime}$ | $\mathrm{I}^{\prime}$ | $10^{\prime}$ |  | 8 | 7 | $6^{\prime}$ | $5^{\prime}$ | 4 ＇ | $3^{\prime}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $2^{\circ}$ |

TRAVERSE TABLES．

| 18 |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $18^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | ${ }^{\prime}$ | $4{ }^{1}$ | $5^{\prime}$ |  |  |  |  |  |  |  | 3 | $4^{\prime}$ |  |  |  |  |  |  |
|  | 95 | 9510 | 9509 | 9508 | 9507 | 9506 | 9505 | 9504 | 9503 |  | 3090 | 3093 | 3096 |  | 101 | 3104 | 107 |  |  |  |  |
|  |  |  | 90 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8532 | 85 | 8526 |  |  |  |  |  |  |  |  |  |  |  | 9304 | 9312 | ， | 9329 |  |  |  |
|  |  |  |  | 8031 | 8028 |  | 8021 |  | 80 |  | 12361 |  | 2383 | 23 | 2405 | 2416 | 2427 | 2438 |  |  |  |
|  |  |  |  |  |  |  |  |  | 7517 |  | 1.5451 |  |  | 5492 | 5506 |  | 4 |  |  |  |  |
|  |  | 70 | 70 |  |  |  |  |  |  |  | －854 |  | 8574 |  | 8607 |  | 8641 | 557 | 574 | 869 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1747 | 1767 |  | 180 |  |
|  | 6085 | 607 | 6070 | 60 | 6056 | 60 | 60 | 603 |  |  |  | 4743 | 476 | 4788 | 4810 | 4832 | 4854 | 76 | 4898 |  |  |
|  |  |  |  |  |  |  |  | 5538 | 5530 | 8.5 | 12 | 7836 | 786 | 7886 | 7911 | 7936 |  | 86 |  |  |  |
| 10 | ， |  |  | 5079 |  | 5061 |  |  | 5033 | 硡 | 02 |  | 095 | ， | 101 | 1040 | 1 | 109 |  |  |  |
| 11 | 4616 | 460 | 459 | 458 | 4577 | 4567 | 455 | 454 | 4537 | 10.45 | 3．3992 | 402 | 405 | 40 | 411 | 414 | 417 | 420 |  |  |  |
| 12 | 4127 | 41 | 4105 |  | 4084 | 407 | 408 | 4051 | 404 | 11. |  | 7115 | 71 |  |  |  | 7281 | 7314 |  |  |  |
| 13 | 36 |  | 36 |  |  |  |  | 3555 | 3544 | 12 |  | 0208 | 02 | 02 | 031 | 0352 |  | 04 |  |  |  |
| 14 | 31 |  |  |  |  |  |  |  | 3047 |  |  | 3301 | 33 |  | 34 |  | 3495 |  |  |  |  |
| 15 | 2658 |  |  |  | 2604 | 2591 | 2577 | 2564 | 2550 | 14.25 | 4.63 | 6394 | 64 | 647 | 651 | 6560 | 6601 | 6643 | 66 |  | 15 |
|  | 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 159 |  | 16 | 16 | 1618 | 1603 | 1588 | 1572 | 155 | 16 |  | 25 |  |  |  |  | 2815 |  |  |  |  |
| 18 |  |  |  |  |  |  | 1093 |  | 1060 |  |  |  | 57 | 5772 | 5822 | 5872 | 5922 | 5972 | 6021 |  | 18 |
|  | 070 |  |  |  | 0632 |  |  |  | 0564 |  |  | 8766 | 8818 | 8871 | 8923 | 8976 |  | 9081 | 9134 |  | 19 |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 硅 |  |  |  | 20 |
| 21 |  |  |  |  |  |  |  |  |  |  |  | 4952 | 5010 | 50 | 5126 | 5184 | 52 | 5300 | 535 | 54 | 21 |
| 2 | 923 |  |  |  |  |  |  |  | 9074 |  |  | 8045 | 81 |  | 8227 | 82 | 834 | 841 |  |  | 22 |
| 23 | 87 |  | 87 | 86 |  |  | 86 | 8598 | 857 | 21 |  | 1138 | 120 |  | 1328 |  | 1456 |  |  |  |  |
| 2 | 823 |  | 82 |  |  |  | 812 |  |  |  |  |  | 42 |  |  |  | 456 |  |  |  |  |
| 25 | 776 | 774 | 771 | 76 | 7674 | 7652 | 7629 | 7606 | 758 | 23 | 7.7254 | 7323 | 73 | 74 | 7531 | 7600 | 76 | 77 | 78 |  | 25 |
|  | 727 | 725 | 72 |  |  |  |  |  |  |  |  | 0416 | 04 |  |  |  |  |  |  |  |  |
|  | 67 |  |  | 67 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 | 53 |  |  |  |  |  | 5155 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 | 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 433 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 33 | 384 |  |  |  |  |  |  |  |  |  |  |  | 525 | 53 | 23 |  |  |  |  |  |  |
| 34 | 33 |  | 32 | 32 |  |  |  |  |  |  |  |  | 525 | 53 |  |  |  |  |  |  |  |
| 35 | 28 | 2838 | 280 | 277 | 2744 | 2712 | 2680 |  | 2617 | 33＇2586 | 10.8156 | 825 | 835 | 84 |  |  | 8737 | 8834 |  |  | 35 |
| 36 | 2380 | 23 | 23 | 228 | 2251 | 2218 | 2186 | 2153 | 2121 | 34 | 11 | 134 | 144 |  |  |  |  |  |  |  |  |
|  | 189 |  |  |  |  |  |  |  | 1624 |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 14 | 13 | 13 | 12 |  |  | 1196 |  | 1127 |  | $1 \cdot$ | 75 | 76 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 0423 | 038 |  |  | 027 | 02 |  | －180 | 0134 |  |  | 3717 |  |  |  |  | 1427 | 4381 |  |  |  |
|  | 9933 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9444 |  |  |  |  |  |  |  |  |  | 12. |  |  |  |  |  |  |  |  |  | 42 |
| 43 |  |  | 887 | 88 | 87 | 87 | 87 |  | 864 | 40 | 13 |  | 31 | 32 | 335 |  |  | 37 |  |  | 43 |
| 44 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 46 |  |  |  |  |  |  |  |  |  |  |  | 2275 |  |  |  |  |  | 303 |  |  | 46 |
| 47 | 657 |  |  | 68 |  |  |  |  |  |  |  | 536 |  |  |  |  |  |  |  |  |  |
| 48 | 650 |  |  |  |  |  |  | 6204 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  | 08 |  |  |  | 1554 |  | 182 |  |  |  |  |  |  |  |
| 50 | 5528 | 5483 | 5438 | 5393 | 5348 | 53 | 52 | 5213 | 167 | 47 | 15. | 4647 | 478 | 492 | 506 |  |  | 54 | 56 |  | 50 |
|  | 5039 4549 | ${ }_{4}^{4993}$ | 49 | 490 | 48 | 48 | ${ }_{4}^{4763}$ | 14717 | 67 |  | 15 | 7770 |  |  |  |  |  |  |  |  |  |
|  | 4549 | 4503 |  |  |  | 4315 | 4268 | 4221 | 4174 |  |  | 083 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 3725 |  |  |  |  |  |  |  |  |  |  |  |  | 53 |
|  |  |  |  | 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 54 |
| 55 | 3081 | 3032 | 2982 |  |  |  | 2784 | 2734 |  |  |  | 11 |  | 04 |  |  | 0872 | 1024 | 1176 |  |  |
| 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 210 |  |  |  |  |  | 1794 | 17 | 169 |  | $17 \cdot 6$ |  | 645 |  |  |  |  | t |  |  |  |
|  |  |  |  |  |  |  |  | 1247 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 | 0634 |  | 052 |  |  |  |  | 0255 | 0201 | 57.01 | 18.5410 | 硣 |  | 5908 | 6074 |  | 研 | 6572 |  |  |  |
|  | 1 | 009 |  |  |  |  |  |  | 970 |  |  | 86 | 18838 |  |  |  | 19513 |  |  |  |  |
|  | 9655 | 95 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 916 | 91 |  | 89 |  |  | 8825 | 8768 | 31 | 59.86 | 19.4 | 48 | S12 |  |  |  | 572 |  |  |  |  |
| 64 | 867 | 86 | 85 | 850 |  |  | 83 |  | 821 | $60 \cdot 81$ | 19.77 | 794 | 812 | 830 |  | 8656 | 833 | 91 |  |  |  |
| 65 | 8187 | 8128 |  | 801 | 79 | 7894 |  | 7776 | 771 | 6176 | 20.086 | 104 | 122 | 140 | 158 | 1760 | 194 | 21 | 229 |  | 65 |
|  | 769 | 7638 |  | 75 |  |  |  |  | 7221 |  | 20．3 |  | 43 |  |  |  |  | ${ }^{5229}$ |  |  |  |
|  | ． |  |  |  |  |  |  |  | 672 |  |  |  |  |  |  |  |  | 833 | 852 |  |  |
|  |  |  |  |  |  | 64 |  |  |  |  |  |  |  |  |  |  |  |  | 163 |  |  |
| ${ }_{70} 6$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 476 | 46 | 46 | 45 | 4501 | 4436 | 4371 | 43 | 424 |  |  |  | 28 |  |  |  |  |  |  |  |  |
| 73 | 42 | 4206 | 4140 | 407 | 4008 |  |  |  |  |  |  |  | 598 |  |  |  |  |  |  |  |  |
| 75 | 3782 |  |  | 35 |  |  |  |  |  |  |  |  |  |  |  |  |  | －10 |  |  |  |
| 75 | 3292 | 322 | 315 | 308 |  |  |  |  | 27 | 71.268 | 23. | 1970 | 硣 |  | 25 |  |  | 13215 |  |  |  |
|  | 280 | 27 |  | 259 | 2529 | 2461 | 23 | 232 | 225 | 72 |  | 506 | 52 |  |  |  |  | 632 | ｜65 |  |  |
|  | 231 | 22 | 2175 | 216 | 15 | 17 | 18 | 133 | 1758 | 7 | 23 | 8156 | 836 |  |  |  |  | 943 |  |  |  |
|  | 182 | 17 | 168 | 16 | 15 | 14 | 14 | 1332 | 126 | 74. | $24 \cdot 10$ | 124 | 14 | 16 |  | 21 | 2328 | 2543 | 2759 |  | 78 |
| 79 | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 80 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 02 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 97 |  |  | 94 | 9423 | 9349 | 927 | 77 | 25 | 362 | 384 | 4074 | 43 |  | 47 |  | 52 |  |  |
|  | 937 |  |  |  |  |  |  |  | 8778 |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{85}^{84}$ | 88 |  |  | ${ }_{81}^{861}$ |  | 88015 |  |  | ${ }_{778}^{828}$ |  |  |  |  |  |  |  |  |  |  |  |  |
| 86 | 79 |  |  |  |  | 75 | 74 |  |  |  |  | 599 |  |  |  |  |  |  |  |  |  |
|  | 74 |  | 726 |  |  |  |  |  | 6791 |  |  |  |  |  |  |  |  |  | 077 |  |  |
| 88 | 69 | 685 6360 | 6771 | ${ }_{6200}^{669}$ | 6613 | 6533 |  | ${ }_{5}^{6374}$ | 6295 5798 |  |  | 2178 | 242 |  | 290 |  |  |  |  |  |  |
|  | 5440 | 5870 | 5789 | 5708 | 5627 | 5545 | 5959 |  | 530 | 84.5717 85.5220 | $27 \cdot 8115$ | 8364 | 8613 | 8862 | 917 | 936 | ［6502 | 9858 | 110 |  |  |
|  | 546 |  | 5 |  | 15134 | 5052 | 4969 |  | 480 | 86 | 28 | 7450 | 17 | 1915 | 2212 |  |  |  | 3219 |  |  |
|  | 497 | 48 | 4806 | 4724 | 4641 | 45 | 4474 | 4391 | 4308 | 87.422 | 28 | 4550 | 480 | 505 | 531 | 556 |  |  |  |  |  |
|  | 448 | 43 | 431 | 423 | 4148 | 40 |  |  | 3811 | 88．3723 | 28 | 76 | 790 | 815 | 84 | 8677 | 892 | 918 |  |  |  |
| 94 9 |  |  |  |  |  |  |  |  | 281 | 89.323 90.273 | 29.048 29 | 382 | 409 |  |  |  |  |  |  |  |  |
| 95 | 3014 |  |  |  |  |  |  |  | 232 |  |  | 692 |  | 745 |  |  |  |  |  |  |  |
|  | 252 | 243 |  |  |  |  |  |  | 825 | 22 |  | 01 | 028 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 1328 |  |  |  | ， |  |  |  |  |  |  |  |  |
|  | 1035 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 100 | 105 |  | 0877 | 787 | 0696 | 0606 | 0516 | 10425 | 0335 | 95 | 30 | 9294 | 9570 | 9847 | ${ }^{12}$ | 20 | 576 | 53 | 29 | 506 | 100 |
|  | $66^{60^{\prime}}$ | 59＇ | 38＇ | 57 | $56^{\circ}$ | 55 | $54^{\prime}$ | $53^{\prime}$ | $5{ }^{\prime}$ | 51 |  |  |  |  | 56 | $55^{\prime}$ | $54^{\prime}$｜ | $53^{\prime}$ |  | $51^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.

| $18^{\circ}$ |  |  |  |  | Cosine. |  |  |  |  |  | Sine. 18 |  |  |  |  |  |  |  |  | $18^{\circ}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11^{\prime}$ | $12^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{1}$ | 16 | $17^{\prime}$ | 18 | $19^{\prime}$ | $10^{\prime}$ | 11 | $12^{\prime}$ | $13^{\prime}$ | $14^{\prime} 1$ | $15^{\prime}$ | $16^{\prime}$ | $17^{\prime}$ | $18^{\prime}$ |  |  |
|  | 9502 | 95 | 95 | 94 | 9498 | 9497 | 9496 | 9495 | 9494 | .9493 | 3118 | 21 | 3123 | 126 | 3129 | 3132 | 3134 | 3137 | 3140 | 3143 | , |
| 2 | 9003 | 9001 | 8999 | 8998 | 8996 | 8994 | 8992 | 8990 | 8989 | 1/8987 | 6236 | 6241 | 6247 | 6252 | 6258 | 6263 | 6269 | 6274 | 6280 | 6285 | 2 |
| 3 | 8505 | 8502 | 8499 | 8496 | 8494 | 8491 | 8488 | 8486 | 8483 | 2.8480 | 9353 | 9362 | 9370 | 9378 | 9387 | 9395 | 9403 | 9411 | 9420 | 9428 | 3 |
| 4 | 8006 | 8003 | 7999 | 7995 | 7992 | 7988 | 7984 | 7981 | 7977 | $3 \cdot 7973$ | $1 \cdot 2471$ | 2482 | 2493 | 2504 | 2516 | 2527 | 2538 | 2549 | 2560 | 2571 | 4 |
| 5 | 7508 | 7503 | 7499 | 7494 | 90 | 85 | 80 | 7476 | 7471 | 4.7467 | 1.5589 | 5603 | 5617 | 5631 | 5644 | 5658 | 5672 | 5686 | 5700 | 5713 | 5 |
| 6 | 7009 | 7004 | 6998 | 6993 | 6987 | 6982 | 6976 | 6971 | 6966 | 5.6960 | 1.8707 | 8724 | 8740 | 8757 | 8773 | 8790 | 8806 | 8823 | 8840 | 8856 | 6 |
| 7 | 6511 | 6504 | 6498 | 6492 | 6485 | 6479 | 6473 | 6466 | 6460 | 6.6453 | 2.1825 | 1844 | 1863 | 1883 | 1902 | 1921 | 1941 | 1960 | 1979 | 1999 | 7 |
| 8 | 6012 | 6005 | 5998 | 5990 | 5983 | 5976 | 5969 | 5961 | 5954 | 7.5947 | $2 \times 4943$ | 4965 | 4987 | 5009 | 5031 | 5053 | 5075 | 5097 | 5119 | 5141 |  |
| 9 | 5514 | 5506 | 5497 | 5489 | 5481 | 5473 | 5465 | 5457 | 5448 | 8.5440 | 2.8060 | 8085 | 8110 | 8135 | 8160 | 8185 | 8210 | 8234 | 8259 | 8284 |  |
| 10 | 5015 | 5006 | 4997 | 4988 | 4979 | 4970 | 4961 | 4952 | 4943 | 94933 | $3 \cdot 178$ | 1206 | 1233 | 1261 | 1289 | 1316 | 1344 | 1372 | 1399 | 1427 | 10 |
| 11 | 4517 | 4507 | 4497 | 4487 | 4477 | 4467 | 445 | 44 | 14437 | 10\%442 | $3 \cdot 4296$ | 432 | 4357 | 4387 | 4418 | 4448 | 447 | 45 | 4539 | 4570 | 1 |
| 12 | 4018 | 4008 | 3997 | 3986 | 3975 | 3964 | 3953 | 3942 | 3931 | 113920 | 3.7414 | 7447 | 7480 | 7513 | 7547 | 7580 | 7613 | 7646 | 7679 | 7712 | 12 |
| 13 | 3520 | 3508 | 3496 | 3485 | 3473 | 3461 | 3449 | 3437 | 3425 | $12 \cdot 3413$ | 4.0532 | 0568 | 0604 | 0639 | 0675 | 0711 | 0747 | 0783 | 0819 | 0855 | 13 |
| 14 | 3022 | 3009 | 2996 | 2983 | 2971 | 2958 | 2945 | 2932 | 2920 | $13^{\prime 2}$ | 4.3650 | 3688 | 3727 | 3766 | 3804 | 3843 | 3882 | 3920 | 3959 | 3998 | 14 |
| 15 | 2523 | 2509 | 2496 | 2482 | 2469 | 2455 | 2441 | 2428 | 2414 | 14.2400 | 4.6767 | 6809 | 6850 | 6892 | 6933 | 6975 | 7016 | 7057 | 7099 | 7140 | 15 |
| 16 | 2025 | 2010 | 19 | 19 | 1966 | 1952 | 1937 | 1923 | 1908 | 15.1893 | 4.9885 | 9929 | 9974 | +018 | 0062 | 0106 | 0150 | 0195 | 02 | 0283 | 16 |
| 17 | 1526 | 1511 | 1495 | 1480 | 1464 | 1449 | 1433 | 1418 | 1402 | 16.1387 | 5.3003 | 3050 | 3097 | 3144 | 3191 | 3238 | 3285 | 3332 | 3379 | 3426 | 7 |
| 18 | 1028 | 1011 | 0995 | 0979 | 962 | 0946 | 0929 | 0913 | 0897 | 17.0880 | 5.6121 | 6171 | 6220 | 6270 | 6320 | 6369 | 6419 | 6469 | 6519 | 6568 | 18 |
| 19 | 0529 | 0512 | 0495 | 0477 | 0460 | 0443 | 0426 | 0408 | 0391 | 18.0373 | 5.9239 | 9291 | 9344 | 9396 | 9449 | 9501 | 9554 | 9606 | 9659 | 9711 | 19 |
| 20 | 0031 | -013 | 9994 | 9976 | 9958 | 9940 | 9922 | 9903 | 885 | 18.9867 | 6.2356 | 2412 | 2467 | 2522 | 2578 | 2633 | 2688 | 274 | 2799 | 2854 | 20 |
| 21 | 95 | 9513 | 9494 | 9475 | 9456 | 943 | 9418 | 9399 | 9379 | 19. | 6.5474 | 5532 | 5590 | 5648 | 5706 | 5764 | 5822 | 588 | 5938 | 5996 | 21 |
| 22 | 903 | 90 | 8994 | 8974 | 954 | 8934 | 8914 | 8894 | 8874 | $20 \cdot 885$ | 6.8592 | 8653 | 8714 | 8774 | 8835 | 8896 | 8957 | 9018 | 9078 | 9139 | 22 |
| 23 | 8535 | 8514 | 8494 | 8473 | 452 | 8431 | 8410 | 8389 | 8368 | $21 \cdot 8347$ | 7.1710 | 1773 | 1837 | 1901 | 1964 | 2028 | 2091 | 2155 | 2218 | 228 | 23 |
| 24 | 8037 | 8015 | 7993 | 7971 | 50 | 7928 | 7906 | 7884 | 7862 | $22 \cdot 7840$ | $7 \cdot 4828$ | 4894 | 4960 | 5027 | 5093 | 5159 | 5226 | 5292 | 5358 | 542 | 24 |
| 25 | 7538 | 751617 | 7493 | 70 | 7448 | 7425 | 02 | 379 | 7356 | $23 \cdot 7334$ | $7 \cdot 7946$ | 8015 | 8084 | 8153 | 8222 | 8291 | 8360 | 8429 | 8498 | 8567 | 25 |
| 26 | 7040 | 7016 | 69 | 69 | 45 | 6922 | 6898 | 6874 | 6851 | 24.6827 | 1063 | 1135 | 1207 | 12 | 1351 | 1423 | 1494 | 1566 | 1638 | 1710 | 26 |
| 27 | 6541 | 6517 | 6492 | 468 | 6443 | 6419 | 6394 | 6370 | 6345 | 25.6320 | 8.4181 | 4256 | 4330 | 4405 | 4480 | 4554 | 4629 | 4703 | 4778 | 485 | 27 |
| 28 | 6043 | 6018 | 5992 | 67 | 5941 | 5916 | 5890 | 5865 | 5839 | 26.5814 | $8 \cdot 7299$ | 7376 | 7454 | 7531 | 7609 | 7686 | 7763 | 7841 | 7918 | 7995 | 28 |
| 29 | 5545 | 5518 | 5492 | 5466 | 5439 | 5413 | 5386 | 5360 | 5333 | $27 \cdot 5307$ | 9.0417 | 0497 | 0577 | 0657 | 0737 | 0818 | 0898 | 0978 | 1058 | 113 | 29 |
| 30 | 5046 | 5019 | 4992 | 4964 | 4937 | 4910 | 4882 | 4855 | 4828 | 28.4800 | 9.3535 | 3618 | 3700 | 3783 | 3866 | 3949 | 4032 | 4115 | 4198 | 428 | 30 |
| 31 | 454 | 4519 | 4491 | 4463 | 4435 | 4407 | 437 | 4350 | 4322 | 29 | 9.6652 | 6738 | 6824 | 6909 | 6995 | 7081 | 71 | 7252 | 7338 | 7423 | 31 |
| 32 | 4049 | 4020 | 3991 | 62 | 3933 | 3904 | 3875 | 3845 | 3816 | 30'3787 | 9.9770 | 9859 | 9947 | -036 | 0124 | 0212 | 0301 | 0389 | 0478 | 0566 | 32 |
| 33 | 3551 | 3521 | 3491 | 3461 | 3431 | 3401 | 3371 | 3341 | 3310 | 31.3280 | 10.2888 | 2979 | 3071 | 3162 | 3253 | 3344 | 3435 | 3526 | 3618 | 370 | 33 |
| 34 | 3052 | 3021 | 2991 | 60 | 2929 | 2898 | 2867 | 2836 | 2805 | 32.2774 | $10 \cdot 6006$ | 6100 | 6194 | 6288 | 6382 | 6476 | 6570 | 6664 | 6757 | 6851 | 34 |
| 35 | 255 | 2522 | 2490 | 2458 | 2427 | 5 | 2363 | 2331 | 2299 | 33.2267 | 10.9124 | 9221 | 9317 | 9414 | 9511 | 960 | 970 | 980 | 9897 | 9994 | 35 |
| 36 | 2055 | 2023 | 1990 | 57 | 1924 | 1892 | 1859 | 1826 | 1793 | 34.1760 | 11.2242 | 2341 | 2441 | 2540 | 2640 | 273 | 2838 | 2938 | 3037 | 3137 | 36 |
| 37 | 1557 | 1523 | 1490 | 1456 | 1422 | 1389 | 1355 | 1321 | 1287 | 35.1254 | 11.5 | 5462 | 556 | 5666 | 5768 | 5871 | 5973 | 6075 | 6177 | 627 | 37 |
| 38 | 1058 | 1024 | 0989 | 955 | 0920 | 0886 | 0851 | 0816 | 0782 | 36.0747 | 11.8477 | 8582 | 8687 | 8792 | 8897 | 9002 | 9107 | 9212 | 9317 | 9422 | 38 |
| 39 | 0560 | 0525 | 0489 | 0454 | 418 | 0383 | 0347 | 0312 | 0276 | $37 \cdot 0240$ | 12.1595 | 1703 | 1811 | 1918 | 2026 | 2134 | 2242 | 2349 | 2457 | 256 | 39 |
| 40 | 0061 | +025 | 9989 | 9952 | 9916 | 9880 | 9843 | 9807 | 9770 | 37-9734 | 12.4713 | 4823 | 4934 | 5044 | 5155 | 5266 | 5376 | 5487 | 5597 | 570 | 40 |
| 41 | 956 | 95 | 9489 | 9451 | 9414 | 9377 | 9339 | 9302 | 9264 | 38 | 12 | 7944 | 80 | 81 | 8284 | 8397 | 8510 | 8624 | 8737 | 8850 | 41 |
| 42 | 906 | 9026 | 8988 | 50 | 8912 | 8874 | 8835 | 8797 | 8759 | 39'8720 | 13.0949 | 1065 | 1181 | 1297 | 1413 | 1529 | 16 | 76 | 1877 | 1993 | 42 |
| 43 | 8566 | 8527 | 8488 | 8449 | 8410 | 8371 | 8331 | 8292 | 8253 | $40 \cdot 8214$ | 13.4066 | 4185 | 4304 | 4423 | 4542 | 4660 | 477 | 4898 | 5017 | 51 | 43 |
| 44 | 8068 | 8028 | 7988 | 48 | 7908 | 7868 | 7828 | 787 | 7747 | $41 \cdot 7707$ | 13.7184 | 7306 | 7427 | 7549 | 7671 | 7792 | 7914 | 8035 | 8157 | 827 | 44 |
| 45 | 75 | 7528 | 7487 | 7447 | 7406 | 7365 | 7324 | 7283 | 7241 | 00 | 14.0302 | 0426 | 0551 | 75 | 079 | 0924 | 1048 | 172 | 1297 | 142 | 45 |
| 46 | 7071 | 7029 | 6987 | 6945 | 6903 | 6862 | 6820 | 6778 | 6736 | 43.6694 | $14 \cdot 3420$ | 3547 | 3674 | 3801 | 3928 | 405 | 4182 | 4309 | 4437 | 456 | 46 |
| 47 | 6572 | 6530 | 6487 | 444 | 6401 | 6359 | 6316 | 6273 | 6230 | 44.6187 | $14 \cdot 6538$ | 666 | 6797 | 6927 | 7057 | 718 | 7317 | 7447 | 7576 |  | 47 |
| 48 | 6074 | 6030 | 5987 | 43 | 99 | 5856 | 5812 | 5768 | 5724 | 45.5680 | 14.9655 | 9788 | 9921 | +053 | 0186 | 0319 | 0451 | 0584 | 0716 | 0849 | 48 |
| 49 | 5575 | 5531 | 5486 | 2 | 5397 | 5353 | 530 | 5263 | 5218 | 46.5174 | 15.2773 | 2909 | 3044 | 3179 | 3315 | 345 | 3586 | 3721 | 3856 | 399 | 49 |
| 50 | 5077 | 5031 | 4986 | 4941 | 4895 | 4850 | 4804 | 4758 | 4713 | $47 \cdot 4667$ | 15.5891 | 6029 | 6167 | 6306 | 6444 | 6582 | 6720 | 6858 | 6996 | 7134 | 50 |
| 51 | 4578 | 45 | 4486 | 4439 | 439 | 43 | 4300 | 4254 | 4207 | 48.4160 | 15.9009 | 915 | 9291 | 9432 | 957 | 971 | 985 | 99 | +136 |  | 51 |
| 52 | 4080 | 4033 | 85 | 388 | 3891 | 3844 | 3796 | 3749 | 3701 | 49.3654 | 16.2127 | 2270 | 2414 | 2558 | 2702 | 2845 | 2989 | 3132 | 3276 | 342 | 52 |
| 53 | 358 | 3533 | 85 | 3437 | 3389 | 3341 | 3292 | 3244 | 96 | 50.3147 | $16 \cdot 5245$ | 539 | 5537 | 56 | 5830 | 5977 | 6123 | 6270 | 6416 |  | 53 |
| 54 | 3083 | 3034 |  |  | 87 | 2838 | 2788 | 2739 | 2690 | 51.2640 | 16.8362 | 8512 | 8661 | 8810 | 8959 | 9108 | 9258 | 9407 | 9556 | 970 | 54 |
| 55 | 258 | 2535 | 85 | 35 | 2385 | 2335 | 2284 | 2234 | 184 | 52.2134 | $17 \cdot 1480$ | 1632 | 1784 | 1936 | 2088 | 2240 | 2392 | 2544 | 2696 | 848 | 55 |
| 56 | 2086 | 2035 | 1984 | 1933 | 1883 | 1831 | 1780 | 1729 | 1678 | 53.1627 | $17 \cdot 4598$ | 4753 | 4908 | 5062 | 5217 | 5372 | 5526 | 5681 | 5836 | 5990 | 56 |
| 57 | 1588 | 1536 | 84 | 1432 | 1380 | 1328 | 1277 | 1225 | 1173 | 54.1120 | $17 \cdot 7716$ | 7873 | 8031 | 8188 | 8346 | 8503 | 8661 | 8818 |  | 9133 | 57 |
| 58 | 1089 | 1036 | 0984 | 0931 | 0878 | 0825 | 0773 | 0720 | 0667 | 55.0614 | 18.0834 | 0994 | 1154 | 1314 | 1475 | 1635 | 1795 | 1955 | 2116 | 2276 | 58 |
| 59 | 0591 | 0537 |  |  | 0376 | 0322 |  | 15 | 0161 | 56.0107 | 18.3951 | 4115 | 427 | 444 | 4604 | 47 | 4930 | 5093 | 5256 | 5418 | 59 |
| 60 | 0092 | -038 | 83 | 9929 | 9874 | 9819 | 9765 | 9710 | 9655 | 56'9600 | $18 \cdot 7069$ | 7235 | 7401 | 7567 | 7733 | 7898 | 8064 | 8230 | 8396 | 8561 | 60 |
|  |  | 9538 | 9483 | 9428 | 937 | 931 | 9261 | 9205 | 9150 | 57.9094 | 19.0187 | 035 | 0524 | 0693 | 0861 | 1030 | 119 | 136 |  |  | 61 |
| 62 | 9095 | 9039 | 8983 | 8926 | 8870 | 8813 | 8757 | 8700 | 8644 | $58 \cdot 8587$ | 19.3305 | 3476 | 3648 | 3819 | 3990 | 4162 | 4333 | 4504 | 4675 | 4847 | 62 |
| 63 | 8597 | 8540 | 8482 | 8425 | 8368 | 8310 | 8253 | 8196 | 8138 | 59.8080 | 19.6423 | 6597 | 6771 | 694 | 7119 | 7293 | 7467 | 7641 | 78 | 7989 | 63 |
| 64 |  | 1 | 析 | , | 7866 | 7807 | 7749 | 691 | 7632 | $60 \cdot 7574$ | 19.9541 | 9718 | 9894 | (07 | 0248 | 0425 | 0602 | 0778 | 985 | 1132 | 64 |
| 65 | 7600 | 41 | 482 | 23 | 7364 | 7304 | 7245 | 7186 | 7127 | 61.7067 | 20.2658 | 2838 | 3018 | 319 | 3377 | 3556 | 3736 | 391 | 409 | 4275 | 65 |
| 66 | 7101 | 7042 | 6982 | 6922 | 6862 | 6801 | 6741 | 6681 | 6621 | 62.6561 | 20.5776 | 5959 | 6141 | 6323 | 6506 | 6688 | 6870 | 7053 | 7235 | 7417 | 66 |
| 67 | 6603 | 6542 | 6481 | 6420 | 6359 | 6298 | 6237 | 6176 | 6115 | $63 \cdot 6054$ | 20.8894 | 9079 | 9264 | 9450 | 9635 | 9820 | -005 | 0190 |  | 0560 | 67 |
| 68 | 6104 | 6043 | 5981 | 5919 | 5857 | 5795 | 5733 | 5671 | 5609 | 64.5547 | 21-2012 | 2200 | 2388 | 2576 | 2764 | 2951 | 3139 | 3327 | 3515 | 3703 | 68 |
| 69 | 5606 | 5543 | 5481 | 5418 | 5355 | 5292 | 5230 | 5167 | 5104 | 65.5041 | 21.5130 | 5320 | 5511 | 5702 | 5892 | 6083 | 6274 | 6464 | 665 | 6845 | 69 |
| 70 | 5108 | 5044 | 4980 | 4917 | 4853 | 4789 | 4726 | 4662 | 4598 | 66.4534 | 21.8248 | 8441 | 8634 | 8828 | 9021 | 9215 |  | 9601 | 9795 | 9988 | 70 |
| 71 | 4609 | 4545 | 4480 | 4416 | 4351 | 4286 | 4222 | 4157 | 4092 | $67 \cdot 4027$ | 22.1365 | 1562 | 1758 | 1954 | 2150 | 2346 | 2542 | 273 | 2035 | 硣 | 71 |
| 72 | 4111 | 4045 | 3980 | 3914 | 3849 | 3783 | 3718 | 3652 | 3586 | 68.3521 | 22.4483 | 4682 | 4881 | 5080 | 5279 | 5478 | 5677 | 5876 | 6075 | 6273 | 72 |
| 73 | 3612 | 3546 | 3480 | 3413 | 3347 | 3280 | 3214 | 3147 | 3081 | 69.3014 | 22.7601 | 7803 | 8004 | 8206 | 8408 | 8610 | 8811 | 9013 | 9215 | 9416 | 73 |
| 74 | 3114 | 3047 | 2979 | 2912 | 2845 | 2777 | 2710 | 2642 | 2575 | 70.2507 | 23.0719 | 0923 | 1128 | 1332 | 1537 | 1741 | 1946 | 2150 | 2354 | 2559 | 74 |
| 75 | 2615 | 2547 | 2479 | 2411 | 2343 | 2274 | 2206 | 2138 | 2069 | $71 \cdot 2001$ | 23.3837 | 4044 | 4251 | 4458 | 4666 | 4873 | 5080 | 528 | 549 | 5701 | 75 |
| 76 | 2117 | 2048 | 1979 | 1910 | 1841 | 1771 | 1702 | 1633 | 1563 | $72 \cdot 1494$ | 23.6954 | 7165 | 7375 | 7585 | 7795 | 8004 | 8214 | 8424 | 8634 | 8844 | 76 |
| 77 | 1618 |  | 147 | 1 | 1338 | 1268 | 1198 | 128 | 1058 | $73 \cdot 0987$ | $24 \cdot 0072$ | 0285 | 0498 | 0711 | 0923 | 1136 | 134 | 562 | 174 | 1987 | 78 |
| 78 | 1120 | 1049 | 0978 | 0907 | 0836 | 0765 | 0694 | 0623 | 0552 | 74.0481 | 24.3190 | 3406 | 3621 | 3837 | 4052 | 4268 | 4483 | 4699 | 4914 | 5130 | 78 |
| 79 | 0621 | 0550 | 0478 | 0406 | 0334 | 0262 | 0190 | 0118 | 4046 | 74.9974 | 24•6308 | 6526 | 6745 | 6963 | 7181 | 7399 | 7618 | 7836 | 8054 | 8272 | 79 |
| 80 | 0123 | . 050 | 9978 | 9905 | 9832 | 9759 | 9686 | 9613 | 9540 | 75.9467 | 24.9426 | 9647 | 9868 | 1089 | 0310 | 0531 | 0752 | 0973 | 1194 | 1415 | 80 |
| 81 | 9624 | 9551 | 9477 | 9404 | 9330 | 9256 | 182 | 9109 | 9035 | 76.8961 | 25'2544 | 2767 | 2991 | 3215 | 3439 | 3663 | 3886 | 4110 | 4334 | 4558 | 81 |
| 82 | 9126 | 9052 | 8977 | 8903 | 8828 | 8753 | 8679 | 8604 | 8529 | 77'8454 | 25.5661 | 5888 | 6115 | 6341 | 6568 | 6794 | 7021 | 7247 | 7474 | 7700 | 82 |
| 83 | 8627 | 8552 | 8477 | 8401 | 8326 | 8250 | 8175 | 8099 | 8023 | 78•7947 | 25.8779 | 9009 | 9238 | 9467 | 9697 | 9926 | +155 | 038 | 064 | 084 | 83 |
| 84 | 8129 | 8053 | 7977 | 7900 | 7824 | 7747 | 7671 | 7594 | 7517 | 79.7441 | 26.1897 | 2129 | 2361 | 2593 | 2826 | 3058 | 3290 | 3522 | 3754 | 3986 | 84 |
| 85 | 57631 | 7553 | 7476 | 7399 | 7322 | 7244 | 7167 | 7089 | 7012 | 80.6934 | $26 \cdot 5015$ | 5250 | 5485 | 5720 | 5954 | 6189 | 6424 | 6659 | 6894 | 7128 | 85 |
| 86 | 67132 | 7054 | 6976 | 6898 | 6820 | 6741 | 6663 | 6584 | 6506 | 81.6427 | $26 \cdot 8133$ | 8370 | 8608 | 8846 | 9083 | 9321 | 9558 | 9796 | -034 | 27 | 86 |
| 8 | 6634 | 6555 | 6476 | 6397 | 6317 | 6238 | 6159 | 6080 | 6000 | 82.5921 | 27•1251 | 1491 | 1731 | 1972 | 2212 | 2453 | 2693 | 2933 | 173 | 3414 | 87 |
| 88 | 86135 | 6055 | 5975 | 5895 | 5815 | 5735 | 5655 | 5575 | 5494 | 83.5414 | $27 \cdot 4368$ | 4612 | 4855 | 5098 | 5341 | 5584 | 5827 | 6070 | 6313 | 655 | 88 |
| 89 | 95637 | 5556 | 5475 | 5394 | 5313 | 5232 | 5151 | 5070 | 4989 | 84:4907 | 27-7486 | 7732 | 7978 | 8224 | 8470 | 8716 | 8962 | 220 | 453 | 969 | 89 |
| 90 | 05138 | 5057 | 4975 | 4893 | 4811 | 4729 | 4647 | 4565 | 4483 | 85.4401 | 28.0604 | 0853 | 1101 | 1350 | 1599 | 1847 | 2096 | 234 | 2593 | 2842 | 90 |
| 91 | 14640 | 4557 | 4475 | 4392 | 4309 | 4226 | 4143 | 4060 | 3977 | $86 \cdot 3894$ | $28 \cdot 3722$ | 3973 | 4225 | 4476 | 4728 | 4979 | 5230 | 5482 | 5733 | 5984 | 91 |
| 92 | 24141 | 4058 | 3974 | 3891 | 3807 | 3723 | 3639 | 3555 | 3471 | 87-3387 | $28^{6} 6840$ | 7094 | 7348 | 7602 | 7857 | 8111 | 836 | 8619 | 8873 | 9127 | 92 |
| 93 | 33643 | 3558 | 3474 | 3390 | 3305 | 3220 | 3135 | 3051 | 2966 | 88.2881 | 28.9957 | +214 | 0471 | 0728 | 0985 | 1242 | 1499 | 1756 | 2013 | 2270 | 93 |
| 94 | 43144 | 3059 | 2974 | 388 | 2803 | 2717 | 2632 | 2546 | 2460 | 89.2374 | $29 \cdot 3075$ | 3335 | 3595 | 3855 | 4114 | 4374 | 4634 | 4893 | 5153 | 5412 | 94 |
| 95 | 52646 | 2560 | 2473 | 2387 | 2301 | 2214 | 2128 | 2041 | 1954 | 90.1867 | 29.6193 | 6456 | 6718 | 698 | 724 | 506 | 7768 | 803 | 829 | 55 | 95 |
| 96 | $6{ }^{2147}$ | 2060 | 1973 | 1886 | 1799 | 1711 | 1624 | 1536 | 1448 | 91.1361 | 29.9311 | 9576 | 9842 | +107 | 0372 | 0637 | 0902 | 16 | 1433 | 1698 | 9 |
| 97 | 71649 | 1561 | 1473 | 1385 | 1296 | 1208 | 1120 | 1031 | 0943 | 92.0854 | $30 \cdot 2429$ | 2697 | 2965 | 3233 | 3501 | 3769 | 4037 | 430 | 4573 | 4841 | 9 |
| 98 | 1151 | 1062 | 0973 | 0884 | 0794 | 0705 | 0616 | 0526 | 0437 | 93.0347 | 30.5547 | 5817 | 6088 | 6359 | 6630 | 6901 | 7171 | 7442 | 7713 | 7983 | 98 |
|  | 0652 | 0562 | 0472 | 0382 | 0292 | 0202 | 0112 | -022 | 9931 | 93.9841 | 30-8664 | 8938 | 9212 | 9485 | 9759 | -032 | 0306 | 0579 | 0853 | 1126 | 99 |
| 00 | 00154 | -063 | 9972 | 9881 | 9790 | 9699 | 9608 | 9517 | 9426 | 94.9334 | $31 \cdot 1782$ | 2059 | 2335 | 2611 | 2888 | 3164 | 3440 | 3716 | 3993 | 4269 | 100 |
|  | 50' | $49^{\prime}$ | 48' | $147^{\prime}$ | $46^{\prime}$ | 45 | $44^{\prime}$ | \| $43{ }^{\prime}$ | $42^{\prime}$ | 1 $41^{\prime}$ | $50^{\prime}$ | $149{ }^{\prime}$ | $148^{\prime}$ | $47^{\prime}$ | $46^{\prime}$ | $45^{\prime}$ | $44^{\prime}$ |  | $42^{\prime}$ | 41 |  |
| 71 | 1 |  |  |  | S |  |  |  |  |  |  |  |  |  |  | NE. |  |  |  |  | $71^{\circ}$ |

TRAVERSE TABLES．

| $18^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． 1 |  |  |  |  |  |  |  |  |  | $18^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 20 | $21^{\prime}$ | $22^{\prime}$ | 23 | $24^{\prime}$ | $25^{\prime}$ | T26 | 27 | $28^{\prime}$ | 29 |  |  |  | 23 | ， | $25^{\prime}$ |  |  |  |  |  |
|  | 9492 | 9492 | 9491 | 9490 |  |  | 9487 | 9486 | 948 |  |  | 3148 |  |  |  |  |  |  |  |  |  |
|  | 8985 | 8983 | 8981 | 8979 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 94 |  |  |  |  |  |
|  | 7970 |  | 79 |  |  |  | 7948 |  |  |  | －2582 | 2593 | 2604 | 2615 | 2626 | 2637 | 2648 | 2659 | 2670 | 2681 |  |
|  |  |  |  |  |  |  |  |  |  | 473 | 727 |  |  |  |  | 5796 |  | 5824 | 5838 |  |  |
|  | 6955 | 6949 | 694 | 69 | 6933 | 6927 | 22 | 6916 | 691 | 5.690 | 1.8873 | ${ }^{8889}$ | 8906 | 89 | 8939 | 895 | 897 | 89 | 9005 | 902 |  |
|  | 6447 | ${ }^{6451}$ | 64 | 6428 |  | 6415 | 208 | 6402 | ${ }^{639}$ | 6．63 | 2.2018 2.5164 | 2037 | 2057 | 2076 | 2095 | 21 | 21 | 2153 | 217 |  |  |
|  | 5939 |  |  |  |  |  | 5895 | 5888 | 588 | 7.58 | 2.5164 | 5186 | 5208 | 5230 | 5252 | 527 | 5296 | 5318 | 5340 |  |  |
|  | 5 | 5 |  |  |  |  |  | 53 |  |  |  | 8334 | 8359 | 8384 |  | 843 | 8458 | ， | 8508 |  |  |
| 10 | 4924 | 4915 | 490 | 489 | 488 | 4878 | 48 | 48 | 4851 | $9 \cdot 484$ | $3 \cdot 1454$ |  | 1510 | 153 | 15 | 159 | 1620 | 1648 | 167 |  |  |
| 11 | 4417 | 4407 |  |  |  |  | 4356 | ${ }^{4346}$ | 4336 | 10 | $3 \cdot 460$ | 633 | 硡 | 4691 | 4721 | 475 | 478 | 48 | 484 |  |  |
| 12 | 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13 | 3402 |  |  |  |  |  |  | 3318 | 3306 | 12 32 |  | 0927 |  |  | 1034 | T02 |  | 1 | 1178 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | ¢ | 4114 |  |  | 42 |  |  |  |  |  |
| 15 | 238 |  |  |  |  |  |  |  |  | 14 |  |  |  |  | 7347 |  |  | 7472 | 7513 |  |  |
| 16 | 187 |  |  |  |  |  |  |  | 17 | 15 | 5.0327 | 71 | 0416 | 046 |  |  |  |  |  |  |  |
|  | 137 |  |  |  |  |  | 1278 |  | 12 |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 | 0864 | 0847 | 08 |  |  |  |  | 0748 | 0731 |  |  | 6668 | 6717 | 6767 | 6817 | 68 |  | 6966 |  |  |  |
| 19 | 0356 |  |  |  |  |  |  |  | 0217 |  | 5.9764 | 9816 | 9868 |  | 9973 | 0 | 0078 | 0131 | 0183 |  |  |
| 20 | 984 |  | 9812 |  | 寿 |  |  |  | 9702 | 1896 | 2909 | 位 | 1019 | 301 | 3130 | 318 |  |  |  |  |  |
| 21 | 9341 | 9322 | 9302 | 928 | 92 | 92 | 9225 | 9206 | 9187 | 19.91 | 605 | 6112 | 617 | 622 | 6286 | 634 | 6402 | 6460 | 6518 |  | 1 |
| 22 | 8833 | 8813 |  |  |  | 8733 |  | 86 | 86 | $20 \cdot 86$ |  | 9261 |  | 93 |  |  |  | 9625 |  |  |  |
| 23 | 832 | 83 | 82 | 82 | 8241 |  |  | 8178 | 8157 | 21 | $7 \cdot 2345$ |  |  | 2536 |  |  |  |  | 2853 |  |  |
|  | 7818 |  |  |  |  |  |  |  | 7642 |  | 7.5491 | 5557 |  |  |  | 5822 |  | 5 |  |  | 24 |
| 25 | 731 | 728 | 72 | 7242 | 721 | 71 | 7173 |  | 7127 | 23 | 7.86 | 8705 | 8774 | 8843 |  | 89 |  | 911 | 9188 |  | 25 |
|  | 680 | 67 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 6296 |  |  | 62 |  |  |  |  |  |  |  |  |  | 515 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1778 |  |  |  |
| 30 | 47 |  |  |  |  |  |  |  | 4552 |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 | 42 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7937 |  | 8108 |  |  |  |
|  | 3250 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $33$ |  |  |  |  |  |  |  |  |  | $32 \cdot 24$ | 10.6 |  |  |  |  |  |  |  |  |  |  |
| 35 | 2235 | 2203 | $\begin{aligned} & 268 \\ & 217 \end{aligned}$ | 213 | 21 | $\left\lvert\, \begin{aligned} & 258 \\ & 207 \end{aligned}\right.$ | 20 |  | 197 | （32．194 | 11.00 | ${ }_{0187}$ | 1 | ${ }_{0381}$ | 04 | ${ }_{05}$ |  |  |  |  | 34 <br> 35 |
|  | 172 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 969 |  |  | 958 |  |  | 9477 |  | 9403 | 37．9366 | 12.5818 |  |  |  |  |  |  |  |  |  |  |
| 41 |  |  |  |  |  |  |  |  |  |  | 128963 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 817 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 | 715 |  |  |  |  | 6953 | 6911 |  |  | 42.6787 | 14.1545 |  |  | 1918 | 2042 | 2166 |  |  | 253 |  | 45 |
| 46 | 665 |  |  | 652 |  | 6441 | 6398 | 6356 | 6314 | 43.6271 | $14 \times 4691$ | 4818 |  |  |  | 53 |  |  |  |  | 46 |
|  | 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 | 56 |  |  |  |  | 5416 |  | 5381 | 52 | 45.5 |  |  |  |  |  |  |  |  |  |  |  |
| 49 | 512 |  |  |  |  |  |  | 4814 | 47 | 46.472 | 15 | 426 | 43 | 453 |  |  |  |  |  |  |  |
| 50 | 4621 | 457 | 453 | 448 | 443 | 4392 | 4346 | 4300 | 4254 | $47^{4} 420$ | 157272 | 741 | 754 | 7687 | 78 | 796 | 810 | 8239 | 83 |  |  |
|  | 411 | 406 | 402 |  |  |  | 33 |  | 3739 | 48 | 16. |  |  |  |  |  |  |  |  |  |  |
|  |  | 35 | 35 |  | 3416 |  | 33 |  | 32 | 49.3176 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 231 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 | 2083 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 108 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 05 |  |  |  |  | 0295 |  |  |  |  | 18.2 |  |  |  |  |  |  |  |  |  |  |
|  | ＋0， |  |  |  |  |  |  |  |  |  | 18.5 |  |  |  |  |  | 6559 |  |  |  |  |
| 60 | 954 | 949 | 94 | 938 | 9326 | 9271 | 9215 | 9160 | 9105 | 56．9050 | 18.872 | 889 | 905 | 9224 |  | 955 | 9721 | 9886 | －052 | 02 |  |
|  | 903 | 89 | 89 | ${ }^{88}$ | 8814 | 8758 |  |  |  |  | 19.18 |  |  | 23 |  | 271 |  | 3051 |  |  |  |
|  | 853 | 8474 | 析 |  |  |  |  |  |  |  |  |  |  |  |  | 5 21 |  |  |  |  |  |
|  |  |  | 797 | 73 |  |  |  |  |  | 59.7 |  |  |  |  |  | 9033 |  |  |  |  |  |
|  |  |  | 738 | 73 |  | 7222 |  |  | 7035 | 60 |  | 148 | 16 |  | 201 | 2192 |  | 25 | 27 |  | 64 |
| 65 | 700 | 69 | 6889 | 6829 | 6769 | 6710 |  |  | 65 | 61.64 | 20 | 463 | 48 | 49 | 5172 | 535 |  | 57 | 58 |  |  |
|  |  |  |  |  |  |  |  |  | ${ }^{6015}$ |  |  |  |  |  | 8328 | 8511 |  |  |  |  |  |
|  |  |  |  |  |  | 5685 |  |  | 550 | $63 \cdot 5$ | 21. | 093 |  |  | 485 |  | 185 |  |  |  |  |
| 68 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 68 |
|  |  |  |  |  |  |  |  |  | $447$ |  |  | 72 |  |  |  |  | 17 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 243 | 337 | 析 | 327 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 243 | 2880 | 2813 | 2746 |  | 2612 | 2545 | 2478 | 241 |  | $22^{22} 9$ | 981 |  |  | 0424 |  |  |  |  |  |  |
| 74 | 244 | 析 |  |  |  |  |  |  | 1 |  | 23.27 |  |  |  |  |  |  | 4193 |  |  |  |
| 75 | 1932 | 186 |  |  |  | 15 | ， |  | 138 | $71 \cdot$ | $23 \cdot 59$ | 618 | 63 | 635 |  |  | 71 |  |  |  |  |
|  | 142 | ${ }^{1355}$ | 1285 | 1216 |  | 1076 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 09 | 084 |  | 0705 |  | 0564 |  |  | 035 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 03 | 02 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 88 | 93 | 9829 | ${ }_{9248}^{9757}$ | 9685 9174 |  |  |  |  | 88 | 75.87 | 24.84 $25 \%$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 85 |  |  | 8292 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 8304 | 8229 | 81 | 80 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 787 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 84 | 736 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 84 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 581 | 5761 |  |  | 5522 |  | 5362 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5333 | 5253 |  |  | 501 |  |  | 4768 | 4687 |  |  |  | 728 | 752 |  | 801 |  |  |  |  |  |
| 90 | 4318 | 4744 | 45 | 401 | 3988 | 3906 | 3823 | 3740 | 4172 | 84： 85900 | 28．3945 | 3339 | 3587 | ${ }^{383}$ | 4084 | 433 | 45 | 168 | 1910 5078 |  |  |
|  | 3811 |  |  |  | 3477 |  |  |  |  |  | 28•6236 |  | 673 |  |  |  |  |  |  |  |  |
|  | 33 | 3219 |  |  |  | 288 |  | 27 | 2627 | $87 \cdot 25$ | 28.93 | 9635 | 988 | $1 / 43$ | 039 | 06 |  |  |  |  |  |
|  |  |  |  |  | 2455 |  | 22 | 2198 | 2113 | 88.20 | 29.25 | 278 | 3040 | 329 | 355 | 381 |  |  |  |  |  |
| 94 | 2288 |  |  |  |  |  |  | 1684 <br> 1170 | 15 | $89 \cdot 15$ | 29.56 | 593 |  |  |  |  |  |  |  |  |  |
| 95 | 178 |  |  |  |  |  | 12 |  |  |  | 29.88 |  | 934 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 0765 |  |  |  |  |  |  |  |  | 91．99 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 100 | 9243 | 9151 | 060 | 8968 | 8876 | 8784 | 8692 | 8600 | 8508 | 94.3416 | 31．4545 | 4821 | 5097 | 5373 | 564 | 5925 | 201 | 6477 | 6753 |  | 100 |
|  | $4{ }^{4}$ | $39^{\prime}$ | 38＇ | $37^{\prime}$ | $36^{\prime}$ | $35^{\prime}$ | 34 | 133＇ | $32^{\prime}$ | $31^{\prime}$ | $10^{\prime}$ | 39 |  | 37 | 36 | $35^{\prime}$ | 34 | $33^{\prime}$ |  | $31^{\prime}$ |  |
|  |  |  |  |  |  | Sine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.

| Cosine. |  |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $18^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 30' | $31^{\prime}$ | $32^{\prime}$ | 33' | $34^{\prime}$ | $3{ }^{\prime}$ | $36^{\prime}$ | 37 | $38^{\prime}$ | $39^{\prime}$ | 30 | 31 | 32 | 33 | 34 | 35 | $36^{\prime}$ | 37 |  |  |  |
|  | 9483 | 948 | 948 | 9480 | 9480 | 9479 | 947 | 947 | 9476 | .9475 | -3173 | 3176 | 3179 | 3181 | 3184 | 3187 | 3190 | 2 | 3195 | 88 |  |
|  | 896 | 8965 | 8963 | 8961 | 8959 | 8957 | 8955 | 8954 | 8952 | 1.8950 | 6346 | 6352 | 6357 | 6363 | 6368 | 6374 | 6379 | 6385 | 6390 | 6396 |  |
|  | 8450 | 8447 | 8444 | 8441 | 8439 | 8436 | 8433 | 8430 | 8427 | $2 \cdot 8425$ | 9519 | 9527 | 9536 | 9544 | 9552 | 9561 | 9569 | 9577 | 9585 | 9594 |  |
|  | 7933 | 7929 | 7926 | 7922 | 7918 | 7914 | 7911 | 7907 | 7903 | 3.7900 | $1 \cdot 2692$ | 2703 | 2714 | 2725 | 2736 | 2747 | 275 | 2769 | 2780 | 2791 |  |
| 5 | 7416 | 7412 | 7407 | 7402 | 7398 | 7393 | 388 | 7384 | 7379 | 4.7374 | 1.5865 | 5879 | 5893 | 5907 | 5920 | 5934 | 5948 | 5962 | 5976 | 598 |  |
|  | 6899 | 6894 | 6888 | 6883 | 6877 | 6872 | 6866 | 6861 | 6855 | 5.6849 | 1.9038 | 9055 | 9071 | 9088 | 9104 | 9121 | 9138 | 9154 | 9171 | 9187 |  |
|  | 6383 | 6376 | 6370 | 6363 | 6357 | 6350 | 6344 | 6337 | 6331 | 6.6324 | 2.2211 | 2231 | 2250 | 2269 | 2289 | 2308 | 2327 | 2346 | 2366 | 2385 |  |
|  | 5866 | 5859 | 5851 | 5844 | 5836 | 5829 | 5821 | 5814 | 5807 | $7 \cdot 5799$ | 2.5384 | 5406 | 5429 | 5451 | 5473 | 5495 | 5517 | 5539 | 5561 | 5583 |  |
|  | 5349 | 5341 | 5333 | 5324 | 5316 | 5308 | 5299 | 5291 | 5282 | 8.5274 | $2 \cdot 8557$ | 8582 | 8607 | 8632 | 8657 | 8682 | 8706 | 8731 | 8756 | 8781 |  |
| 10 | 4832 | 4823 | 4814 | 4805 | 4795 | 4786 | 4777 | 4768 | 4758 | 9.4749 | 31730 | 1758 | 1786 | 1813 | 1841 | 1868 | 1896 | 1924 | 1951 | 1979 | 10 |
| 11 | 4316 | 4305 | 42 | 4285 | 4275 | 4265 | 42 | 4244 | 4234 | 10.4224 | 3.4904 | 4934 | 4964 | 499 | 502 | 505 | 50 | 5116 | 51 | 5176 | 11 |
| 12 | 3799 | 3788 | 3777 | 3766 | 3754 | 3743 | 3732 | 3721 | 3710 | 11.3699 | 3.8077 | 8110 | 8143 | 8176 | 8209 | 8242 | 8275 | 8308 | 8341 | 8374 | 12 |
| 13 | 3282 | 3270 | 3258 | 3246 | 3234 | 3222 | 3210 | 3198 | 3186 | 12.3174 | $4 \cdot 1250$ | 1285 | 1321 | 1357 | 1393 | 1429 | 1465 | 1501 | 1536 | 1572 | 13 |
| 14 | 2765 | 2752 | 2739 | 2726 | 2714 | 2701 | 2688 | 2675 | 2662 | 13.2649 | 4.4423 | 4461 | 4500 | 4538 | 4577 | 4616 | 4654 | 4693 | 4731 | 4770 | 14 |
| 15 | 2249 | 2235 | 2221 | 2207 | 2193 | 2179 | 2165 | 2151 | 2137 | 14.2123 | 4.7596 | 7637 | 7678 | 7720 | 7761 | 7803 | 7844 | 7885 | 7927 | 7968 | 15 |
| 16 | 1732 | 1717 | 17 | 16 | 1673 | 1658 | 1643 | 1628 | 1613 | $15 \cdot 1598$ | 5.0769 | 0813 | 0857 | 0901 | 0945 | 0989 | 103 | 107 | 1122 | 1166 | 16 |
| 17 | 1215 | 1199 | 1184 | 1168 | 1152 | 1136 | 1121 | 110 | 1089 | 16.1073 | 5.3942 | 3989 | 4036 | 4082 | 4129 | 4176 | 422 | 4270 | 4317 | 4364 | 17 |
| 18 | 0698 | 0682 | 0665 | 0648 | 0632 | 0615 | 0598 | 0582 | 0565 | 17.0548 | 5.7115 | 7164 | 7214 | 7264 | 7313 | 7363 | 7413 | 7462 | 7512 | 7562 | 18 |
| 19 | 0182 | 0164 | 0146 | 0129 | 0111 | 0094 | 0076 | 0058 | 0041 | $18 \cdot 0023$ | 6.0288 | 0340 | 0393 | 0445 | 0498 | 0550 | 0602 | 0655 | 0707 | 0759 | 19 |
| 20 | 9665 | 9646 | 9628 | 9609 | 9591 | 9572 | 9554 | 9535 | 9517 | 18.9498 | 6.3461 | 3516 | 3571 | 3626 | 3682 | 3737 | 3792 | 3847 | 3902 | 3957 | 20 |
| 21 | 9148 | 9129 | 9109 | 9090 | 9070 | 9051 | 9031 | 9012 | 8992 | 19.8973 | 6.6634 | 6692 | 6750 | 6808 | 6866 | 6924 | 6981 | 703 | 7097 | 715 | 21 |
| 22 | 8631 | 8611 | 8591 | 8570 | 8550 | 8529 | 8509 | 3489 | 8468 | 20.8448 | 6.9807 | 9868 | 9928 | 9989 | 1050 | 0110 | 0171 | 0232 | 029 | 0353 | 22 |
| 23 | 8114 | 8093 | 8072 | 8051 | 8029 | 8008 | 7987 | 7965 | 7944 | $21 \cdot 7923$ | $7 \cdot 2980$ | 3044 | 3107 | 3170 | 3234 | 3297 | 3361 | 3424 | 3487 | 3551 | 23 |
| 24 | 7598 | 7576 | 7553 | 7531 | 7509 | 7487 | 7464 | 7442 | 7420 | $22 \cdot 7398$ | $7 \cdot 6153$ | 6219 | 6286 | 6352 | 6418 | 6484 | 6550 | 661 | 6683 | 6749 | 24 |
| 25 | 7081 | 7058 | 7035 | 7012 | 6988 | 6965 | 6942 | 6919 | 6896 | $23 \cdot 6872$ | 7.9326 | 9395 | 9464 | 9533 | 9602 | 9671 | 9740 | 980 | 987 | 9947 | 25 |
| 26 | 6564 | 6540 | 6516 | 649 | 6468 | 6444 | 6420 | 6396 | 63 | 24.6347 | 8.2499 | 2571 | 2643 | 2714 | 2786 | 2858 | 2929 | 300 | 3073 | 3144 | 26 |
| 27 | 6047 | 6022 | 5998 | 5973 | 5948 | 5923 | 5897 | 5872 | 5847 | $25 \cdot 5822$ | 8.5672 | 5747 | 5821 | 589 | 5970 | 6045 | 6119 | 6193 | 6268 | 6342 | 27 |
| 28 | 5531 | 5505 | 5479 | 5453 | 5427 | 5401 | 5375 | 5349 | 5323 | 26.5297 | 8.8845 | 8923 | 9000 | 9077 | 9154 | 9231 | 9309 | 9386 | 9463 | 9540 | 28 |
| 29 | 5014 | 4987 | 4960 | 4933 | 4907 | 4880 | 4853 | 4826 | 4799 | 27-4772 | 9.2018 | 2098 | 2178 | 2258 | 2338 | 2418 | 2498 | 2578 | 2658 | 2738 | 29 |
| 30 | 4497 | 4469 | 4442 | 4414 | 4386 | 4358 | 4331 | 4303 | 4275 | 28.4247 | 9.5191 | 5274 | 5357 | 544 | 5522 | 5605 | 5688 | 5771 | 5853 | 5936 | 30 |
| 31 | 3980 | 3952 | 392 | 389 | 386 | 3837 | 3808 | 3779 | 3751 | 29-3722 | 9•8 | 84 | 8535 | 8621 | 8706 | 879 | 887 | 896 | 904 | 91 | 31 |
| 32 | 3464 | 3434 | 3404 | 3375 | 3345 | 3316 | 3286 | 3256 | 3226 | 30.3197 | $10 \cdot 1538$ | 1626 | 1714 | 1802 | 1891 | 1979 | 2067 | 2155 | 224 | 2332 | 32 |
| 33 | 2947 | 2916 | 2886 | 2855 | 2825 | 2794 | 2764 | 2733 | 2702 | 31-2672 | 10.4711 | 4802 | 4893 | 4984 | 5075 | 5166 | 5257 | 5348 | 543 | 5529 | 33 |
| 34 | 2430 | 2399 | 2367 | 2336 | 2304 | 2273 | 2241 | 2210 | 2178 | 32.2146 | 10.7884 | 7977 | 8071 | 8165 | 8259 | 8352 | 8446 | 8540 | 863 | 8727 | 34 |
| 35 | 1913 | 1881 | 1849 | 18 | 1784 | 1751 | 1719 | 1686 | 1654 | $33 \cdot 1621$ | $11 \cdot 1057$ | 1153 | 1250 | 1346 | 1443 | 1539 | 1636 | 1732 | 182 | 1925 | 35 |
| 36 | 1397 | 1363 | 1330 | 1297 | 1263 | 1230 | 1197 | 1163 | 1130 | 34.1096 | 11.4230 | 4329 | 4428 | 4528 | 4627 | 4726 | 4825 | 4925 | 5024 | 5123 | 36 |
| 37 | 0880 | 0846 | 0811 | 0777 | 0743 | 0709 | 0674 | 0640 | 0606 | 35.0571 | 117403 | 7505 | 7607 | 770 | 7811 | 7913 | 8015 | 8117 | 821 | 8321 | 37 |
| 38 | 0363 | 0328 | 0293 | 0258 | 0222 | 0187 | 0152 | 0117 | 0081 | 36.0046 | 12.0576 | 0681 | 0785 | 0890 | 0995 | 1100 | 1205 | 1309 | 141 | 1519 | 38 |
| 39 | 9846 | 9810 | 9774 | 9738 | 9702 | 9666 | 9630 | 9593 | 9557 | 36.9521 | 12.3749 | 3856 | 3964 | 4072 | 4179 | 4287 | 4394 | 4502 | 4609 | 4717 | 39 |
| 40 | 93 | 9293 | 9256 | 19 | 82 | 9144 | 9107 | 9070 | 9033 | 37.8996 | 12.6922 | 7032 | 7143 | 7253 | 7363 | 7473 | 7584 | 7694 | 7804 | 7915 | 40 |
| 41 | 8813 | 8775 | 8737 | 8699 | 8661 | 8623 | 858 | 8547 | 8509 | 38.8471 | 13 | 020 | 0321 | 0434 | 0547 | 0660 | 0773 | 0886 | 0999 | 1112 | 41 |
| 42 | 8296 | 8257 | 8218 | 8179 | 8141 | 8102 | 8063 | 8024 | 7985 | 39.7946 | 13.3268 | 3384 | 3500 | 3615 | 3731 | 3847 | 3963 | 4079 | 419 | 4310 | 42 |
| 43 | 7779 | 7739 | 7700 | 7660 | 7620 | 7580 | 7540 | 7501 | 7461 | $40 \cdot 7421$ | 13.6441 | 6560 | 6678 | 6797 | 6915 | 7034 | 7152 | 7271 | 739 | 7508 | 43 |
| 44 | 7262 | 7222 | 7181 | 7140 | 7100 | 7059 | 7018 | 6977 | 6936 | $41 \cdot 6895$ | 13.9614 | 9735 | 9857 | 9978 | +099 | 0221 | 0342 | 0463 | 058 | 0706 | 44 |
| 45 | 6746 | 6704 | 6663 | 6621 | 6579 | 6538 | 6496 | 6454 | 6412 | 42.6370 | 14.2787 | 2911 | 3035 | 3159 | 3284 | 3408 | 3532 | 365 | 378 | 3904 | 45 |
| 46 | 6229 | 6186 | 6144 | 6101 | 605 | 6016 | 5973 | 5931 | 5888 | 43.5845 | 14.5960 | 6087 | 6214 | 6341 | 6468 | 6594 | 6721 | 6848 | 6975 | 7102 | 46 |
| 47 | 5712 | 5669 | 5625 | 5582 | 5538 | 5495 | 5451 | 5408 | 5364 | 44.5320 | 14.9133 | 9263 | 9392 | 9522 | 9652 | 9781 | 9911 | -040 | 0170 | 0300 | 47 |
| 48 | 5195 | 5151 | 5107 | 5062 | 5018 | 4973 | 4929 | 4884 | 4840 | $45 \cdot 4795$ | 15.2306 | 2439 | 2571 | 2703 | 2836 | 2968 | 3100 | 3233 | 336 | 3497 | 48 |
| 49 | 4679 | 4633 | 4588 | 4543 | 4497 | 4452 | 4407 | 4361 | 4316 | $46 \cdot 4270$ | 15.5479 | 5614 | 5750 | 5885 | 6020 | 6155 | 6290 | 6425 | 656 | 6695 | 49 |
| 50 | 4162 | 4116 | 4069 | 23 | 3977 | 31 | 3884 | 3838 | 3791 | $47 \cdot 3745$ | $15 \cdot 8652$ | 8790 | 8928 | 9066 | 9204 | 9342 | 9480 | 9618 | 9755 | 9893 | 50 |
| 51 | 3645 | 3598 | 3551 | 3504 | 3456 | 3409 | 362 | 3315 | 3267 | $48^{\circ} 32$ | 16•1825 | 19 | 107 | 2247 | 8 | 2529 | 2669 | 10 | 2950 |  |  |
| 52 | 3128 | 3080 | 3032 | 2984 | 2936 | 2888 | 2840 | 2791 | 2743 | 49.2695 | 16.4998 | 5142 | 5285 | 5429 | 5572 | 5715 | 5859 | 6002 | 6146 | 6289 | 52 |
| 53 | 2612 | 2563 | 2514 | 2465 | 2416 | 2366 | 2317 | 2268 | 2219 | $50 \cdot 2170$ | 16.8171 | 8318 | 8464 | 8610 | 8756 | 8902 | 9048 | 9195 | 9341 | 9487 | 53 |
| 54 | 2095 | 2045 | 1995 | 1945 | 1895 | 1845 | 1795 | 1745 | 1695 | $51 \cdot 1644$ | $17 \cdot 1345$ | 1493 | 1642 | 1791 | 1940 | 2089 | 2238 | 2387 | 253 | 2685 | 54 |
| 55 | 1578 | 1527 | 1476 | 1426 | 1375 | 1324 | 1273 | 1222 | 1170 | 52.1119 | 17*4518 | 4669 | 4821 | 4973 | 5124 | 5276 | 5428 | 5579 | 573 | 588 | 55 |
| 56 | 1061 | 1010 | 0958 | 0906 | 0854 | 0802 | 0750 | 0698 | 0646 | 53.0594 | 17.7691 | 7845 | 8000 | 8154 | 8308 | 8463 | 8617 | 8772 | 8926 | 9080 | 56 |
| 57 | 0545 | 0492 | 0439 | 0386 | 0334 | 0281 | 0228 | 0175 | 0122 | 54.0069 | 18.0864 | 1021 | 1178 | 1335 | 1493 | 1650 | 1807 | 1964 | 2121 | 2278 | 57 |
| 58 | -028 | 9974 | 9921 | 9867 | 9813 | 9759 | 9706 | 9652 | 9598 | 54.9544 | 18.4037 | 4197 | 4357 | 4517 | 4677 | 4836 | 4996 | 5156 | 5316 | 5476 | 58 |
| 59 | 9511 | 9456 | 9402 | 9347 | 9293 | 9238 | 9183 | 9129 | 9074 | 55.9019 | 18.7210 | 7372 | 7535 | 7698 | 7861 | 8023 | 8186 | 8349 | 851 | 8674 | 59 |
| 60 | 8994 | 8939 | 8883 | 8828 | 8772 | 8717 | 661 | 8605 | 8550 | 56.8494 | 19.0383 | 0548 | 0714 | 0879 | 1045 | 1210 | 1376 | 1541 | 1706 | 1872 | 60 |
| 61 | 8477 | 8421 | 365 | 308 | 8252 | 8195 | 139 | 8082 | 8025 | 57.7969 | $19 \cdot 3556$ | 372 | 3892 | 4061 | 4229 | 4397 | 4565 | 4733 | 4901 | 50 | 61 |
| 62 | 7961 | 7903 | 7846 | 7789 | 7731 | 7674 | 7616 | 7559 | 7501 | 58.7444 | 19.6729 | 6900 | 7071 | 7242 | 7413 | 7584 | 7755 | 7926 | 8097 | 8268 | 62 |
| 63 | 7444 | 7386 | 7328 | 7269 | 7211 | 7153 | 7094 | 7036 | 6977 | 59.6919 | 19.9902 | -076 | 0249 | 0423 | 0597 | 0771 | 0944 | 1118 | 1292 | 1465 | 63 |
| 64 | 6927 | 6868 | 6809 | 6750 | 6690 | 6631 | 6572 | 6512 | 6453 | 60.6393 | 20.3075 | 3252 | 3428 | 3605 | 3781 | 3958 | 4134 | 4310 | 4487 | 4663 | 64 |
| 65. | 6410 | 6350 | 6290 | 6230 | 6170 | 6110 | 6049 | 5989 | 5929 | 61.5868 | 20.6248 | 6427 | 660 | S7 | 391 | 7144 | 7324 | 7503 | 768 |  | 65 |
| 66 | 5894 | 5833 | 5772 | 5711 | 5650 | 5588 | 5527 | 5466 | 5405 | 62.5343 | 20.9421 | 9603 | 9785 | 9967 | +149 | 0331 | 0513 | 0695 | 0877 | 1059 | 66 |
| 67 | 5377 | 5315 | 5253 |  | 5129 | S06 | 5005 | 4943 | 4880 | 63.4818 | 21.2594 | 2779 | 2964 | 3149 | 3333 | 3518 | 3703 | 3887 | 8072 | 4257 | 67 |
| 68 | 4860 | 4797 | 4734 | 4672 | 4609 | 4546 | 4483 | 4419 | 4356 | 64•4293 | 21.5767 | 5955 | 6142 | 6330 | 6517 | 6705 | 6892 | 7080 | 7267 | 7455 | 68 |
| 69 | 4343 | 4280 | 4216 | 4152 | 4088 | 4024 | 3960 | 3896 | 3832 | $65 \cdot 3768$ | 21.8940 | 9131 | 9321 | 9511 | 9701 | 9892 | +082 | 0272 | 0462 | 0653 | 69 |
| 70 | 3827 | 3762 | 3697 | 3632 | 3568 | 3503 | 3438 | 3373 | 3308 | $66 \cdot 3243$ | 22.2113 | 2306 | 2499 | 2692 | 288 | 3079 | 3272 | 3465 | 365 | 3850 | 70 |
| 71 | 3310 | 3244 | 3179 | 3113 | 3047 | 2981 | 2916 | 2850 | 2784 | 67.2718 | 22.5286 | 5482 | 5678 | 5874 | 6070 | 6265 | 6461 | 6657 | 6853 | 704 | 7 |
| 72 | 2793 | 2727 | 2660 | 2593 | 2527 | 2460 | 2393 | 2326 | 2260 | 68.2193 | 22•8459 | 8658 | 8857 | 9055 | 9254 | 9452 | 9651 | 9849 | +048 | 0246 | 72 |
| 73 | 2276 | 2209 | 2141 | 2074 | 2006 | 1939 | 1871 | 1803 | 1735 | $69 \cdot 1667$ | $23 \cdot 1632$ | 1834 | 2035 | 2236 | 2438 | 2639 | 2840 | 3042 | 3243 |  | 73 |
| 74 | 1760 | 1691 | 1623 | 1554 | 1486 | 1417 | 1349 | 1280 | 1211 | 70.1142 | 23'4805 | 5010 | 5214 | 5418 | 5622 | 5826 | 6030 | 6234 | 6438 | 6642 | 74 |
| 75 | 1243 | 1173 | 1104 | 1035 | 0965 | 6 | 08 | 0757 | 0687 | 71.0617 | 23.7979 | 8185 | 8392 | 859 | 8806 | 9013 | 921 | 9426 | 9633 | 9840 | 75 |
| 76 | 0726 | 0656 | 0586 | 0515 | 0445 | 0375 | 0304 | 0233 | 0163 | 72.0092 | 24.1152 | 1361 | 1571 | 1780 | 1990 | 2200 | 2409 | 2619 | 282 | 3038 | 76 |
| 77 | 0209 | 0138 | +067 | 9996 | 9924 | 9853 | 9782 | 9710 | 9639 | 72.9567 | 24.4325 | 4537 | 4749 | 4962 | 5174 | 5386 | 5599 | 5811 | 6023 | 6235 | 77 |
| 78 | 9692 | 9620 | 9548 | 9476 | 9404 | 9332 | 9259 | 9187 | 9115 | 73.9042 | 24.7498 | 7713 | 7928 | 8143 | 8358 | 8573 | 8788 | 9003 | 921 | 9433 | 78 |
| 79 | 9176 | 9103 | 9030 | 8957 | 8884 | 8810 | 8737 | 8664 | 8590 | 74:8517 | $25^{\circ} 0671$ | 0889 | 1106 | 1324 | 1542 | 1760 | 1978 | 2196 | 241 | 2631 | 79 |
| 80 | 8659 | 8585 | 8511 | 8437 | 8363 | 8289 | 8215 | $8140 \mid$ | 8066 | 75.7992 | 25.3844 | 4064 | 4285 | 4506 | 4726 | 4947 | 5167 | 538 | 5608 | 5829 | 80 |
| 81 | 8142 | 8067 | 7993 | 7918 | 7843 | 7768 | 7692 | 7617 | 7542 | 76.7467 | $25^{\prime} 7017$ | 7240 | 7464 | 7687 | 7910 | 8134 | 8357 | 8580 | 8804 | 9027 | 81 |
| 82 | 7625 | 7550 | 7474 | 7398 | 7322 | 7246 | 7170 | 7094 | 7018 | $77 \cdot 6942$ | 26.0190 | 0416 | 0642 | 0868 | 1094 | 1321 | 1547 | 1773 | 199 | 2225 | 82 |
| 83 | 7109 | 7032 | 6955 | 6879 | 6802 | 6725 | 6648 | 6571 | 6494 | 78.6416 | $26 \cdot 3363$ | 3592 | 3821 | 4050 | 4279 | 4507 | 4736 | 4965 | 5194 | 5423 | 83 |
| 84 | 6592 | 6514 | 6437 | 6359 | 6281 | 6203 | 6125 | 6048 | 5969 | 79.5891 | $26 \cdot 6536$ | 6768 | 6999 | 7231 | 7463 | 7694 | 7926 | 8157 | 838 | 8620 | 84 |
| 85 | 6075 | 5997 | 5918 | 5839 | 5761) | 5682 | , | 5524 | 5445 | 80.5366 | $26 \cdot 9709$ | 994 | 1178 | 0412 | 064 | 088 | 1115 | 1350 | 158 | 181 | 5 |
| 86 | 5558 | 5479 | 5399 | 5320 | 5240 | 5161 | 5081 | 5001 | 4921 | 81:4841 | 27-2882 | 3119 | 3356 | 3594 | 3831 | 4068 | 4305 | 4542 | 4779 | 5016 | 86 |
| 87 | 5042 | 4961 | 4881 | 4800 | 4720 | 4639 | 4559 | 4478 | 4397 | 82.4316 | 27-6055 | 6295 | 6535 | 6775 | 7015 | 7255 | 7495 | 7734 | 7974 | 8214 | 87 |
| 88 | 4525 | 4444 | 4362 | 4281 | 4199 | 4118 | 4036 | 3955 | 3873 | 83.3791 | 27-9228 | 9471 | 9714 | 9956 | +199 | 0442 | 0684 | 0927 | 1169 | 1412 | 88 |
| 89 | 4008 | 3926 | 3844 | 3761 | 3679 | 3596 | 3514 | 3431 | 3349 | 84.3266 | 28.2401 | 2647 | 2892 | 3138 | 3383 | 3628 | 3874 | 4119 | 4364 | 461 | 89 |
| 90 | 3491 | 3408 | 3325 | 3242 | 3158 | 3075 | 2992 | 2908 | 2824 | 85.2741 | 28.5574 | 5822 | 6071 | 6319 | 6567 | 6815 | 7063. | 7312 | 756 | 780 | 90 |
| 91 | 2975 | 2890 | 2806 | 2722 | 2638 | 2554 | 2469 | 2385 | 2300 | $86 \cdot 2216$ | 28•8747 | 8998 | 9249 | 9500 | 9751 | +002 | 0253 | 0504 | 0755 | 1006 | 91 |
| 92 | 2458 | 2373 | 2288 | 2203 | 2117 1597 | 2032 | 1947 | 1862 | 1776 | 87.1691 | $29 \cdot 1920$ | 2174 | 2428 | 2682 | 2935 | 3189 | 3443 | 3696 | 3950 | 420 | 92 |
| 93 | 1941 | 1855 | 1769 | 1683 | 1597 | 1511 | 1425 | 1338 | 1252 | 88.1165 | $29 \cdot 5093$ | 5350 | 5606 | 5863 | 6119 | 6376 | 6632 | 6889 | 7145 | 740 | 93 |
| 94 | 1424 | 1337 | 1251 | 1164 | 1077 | 0990 | 0902 | 0815 | 0728 | 89.0640 | 29.8266 | 8526 | 8785 | 9044 | 9303 | 9563 | 9822 | +081 | 0340 | 059 | 94 |
| 95 | 090 | 0820 | 0732 | 0644 | 0556 | 0468 | 0380 | 0292 | 0204 | 90.0115 | 30.1439 | 1701 | 1963 | 2225 | 248 | 2749 | 3011 | 3273 | 3535 | 379 | 95 |
| 96 | 0391 | 0302 | 0213 | 0125 | +036 | 9947 | 9858 | 9769 | 9679 | 90.9590 | $30^{\circ} 4613$ | 4877 | 5142 | 5407 | 5672 | 5936 | 6201 | 6466 | 6730 | 6995 | 96 |
| 97 | 9874 | 9784 | 9695 | 9605 | 9515 | 9425 | 9335 | 9245 | 9155 | 91.9065 | 30.7786 | 8053 | 8321 | 8588 | 8856 | 9123 | 9391 | 9658 | 9925 | +193 | 97 |
| 98 | 9357 | 9267 | 9176 | 9085 | 8995 | 8904 | 8813 | 8722 | 8631 | 92.8540 | 31.0959 | 1229 | 1499 | 1769 | 2040 | 2310 | 2580 | 2850 | 3120 | 3391 | 98 |
|  | 8840 | 8749 | 8658 | 8566 | 8474 | 8383 | 8291 | 8199 | 8107 | 93.8015 | 31.4132 | 4405 | 4678 | 4951 | 5224 | 5497 | 5770 | 6043 | 6315 | 6588 | 99 |
| 100 | 8324 | 8231 | 8139 | 8046 | 7954 | 7861 | 7768 | 7676 | 7583 | 94.7490 | $31 \cdot 7305$ | 7581 | 7856 | 8132 | 8408 | 8684 | 8959 | 9235 | 9511 | 9786 | 100 |
|  | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | $26^{\prime}$ | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ | $22^{\prime}$ | $21^{\circ}$ | $30^{\prime}$ | $29^{\prime}$ | 885 | $27^{\prime}$ | $26^{\prime}$ | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ | , | 1 |  |
| 7 |  |  |  |  | Sin |  |  |  |  |  |  |  |  |  | Co | INE |  |  |  |  | $71^{\circ}$ |

TRAVERSE TABLES．

| $18^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $18^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\prime}$ | 41 | $42^{\prime}$ | 43 | $44^{\prime}$ | $45^{\prime}$ | 46＇ | $47^{\prime}$ | $48^{\prime}$ | 49 |  | 41 | 42 | 43 | 44 | $45^{\prime}$ | 46 |  |  |  |  |
|  | 94 | 9473 | 947 | 9471 | 947 | 9469 | 9468 | 94 | 94 | ． 9466 | 320 | 3203 | 3206 | 3209 | 3212 | 3214 | 3217 | 3220 | 3223 | 3225 |  |
|  |  |  |  |  |  |  |  | 8935 | 8933 |  | 1 | 6407 | 6412 |  | 6423 | 6429 | 6434 | 6440 | 6445 |  |  |
|  | 8422 | 8419 | 8416 | 8414 | 8411 | 08 | 8405 | 8402 | 839 |  | 02 | 9610 | 96 |  | 963 | 9643 | 9651 | 9660 | 9668 | 9676 |  |
|  |  |  |  |  |  |  | 7873 | 7870 | 7866 |  |  | 2813 | 282 | 2836 | 284 | 2858 | 2869 | 2880 | 2891 | 2902 |  |
| 5 | 7370 | 365 |  |  |  |  |  | 7337 | 332 | 4.7328 | ＇6003 | 01 | 6031 | 6044 | 6058 | 072 | 086 | 6100 | 6113 | 6127 |  |
|  | 68 | 6838 | 6833 | 6827 | 6821 | 6816 |  | 6805 | 6799 | 5.679 | ＇9204 | 9220 | 9237 | 9253 | 9270 | 9286 | 9303 | 9319 | 336 | 352 |  |
|  | 6318 | 6311 | 6305 | 6298 |  |  |  |  |  |  |  | 242 | 2443 | 246 | 24 | 25 | 2520 | 2539 |  |  |  |
|  | 57 |  |  |  |  |  |  |  | 5732 | ． 5 |  | 5627 |  | 5671 | 56 | 5715 | 5737 | 5759 | 5781 | 5803 |  |
|  | 5266 | 525 | 524 | 21 | 5232 | 5224 | 5215 |  |  |  |  |  |  | 8880 | 89 | 89 | 8954 | 897 | 9004 |  |  |
| 10 | 4740 | 4730 | 4721 | 4712 | 4702 | 469 |  |  | 4665 | 9465 | 3.2006 | 2034 | 206 | 208 | 211 | 2144 | 2171 | 2199 | 222 | 225 | 0 |
| 11 | 421 | 4203 | 419 |  |  |  |  |  |  | 10.412 |  | 523 | 526 |  |  |  |  |  |  |  |  |
| 12 | 36 | 3676 |  |  |  |  |  |  | 3598 |  |  |  |  |  |  |  |  | 8639 |  | 70 |  |
| 1 | 3162 | 31 | 313 | 3125 | 31 | 2510 | 308 |  | 30 | 12.30 | 4.1608 | 16 | 1680 | 17 | 17 | 17 | 1823 | 1859 | 1895 | 1930 | 13 |
| 14 | 2636 |  |  |  |  | 2570 | 2557 |  | 2531 | 13.25 |  | 4847 | 4886 | 49 | 49 | 5002 | 5040 | S0 | 5117 | 515 | 14 |
| 15 | 2109 | 2096 | 2082 | 2068 | 54 | ， | 2025 | 2011 | 97 | 14.198 | $4 \cdot 8009$ | 51 | 809 | 8133 | 817 | 8216 | 8257 | 82 | 8340 | 8381 | 15 |
| 16 | 15 | 1569 | 1554 | 1539 | 1524 | 1509 | 1494 | 1479 | 1464 | 15. | 5.1210 | 1254 | 1298 | 1342 | 13 | 1430 | 1474 | 1518 | 1563 | 1607 | 16 |
| 17 | 105 | 1042 |  | 1010 |  | 0978 |  |  |  | 16. | 4411 | 445 | 450 |  |  | 46 | 4692 | 4738 | 4785 | 832 | 17 |
| 18 | 05 | 0515 |  |  | 0464 | 0447 |  |  |  | 17 |  | 7661 | 7710 | 7760 | 7810 | 7859 | 7909 | 7958 | 800 | 805 | 18 |
| 19 | ＋0 | 9 | 99 |  |  | 9 |  |  | 9863 | 17 |  | O8 | 09 |  | 102 | 107 | 1126 | 178 | 203 |  | 19 |
| 20 | 9479 | 9461 | 9442 |  | 9405 | 9386 | 9367 | 9349 | 30 | 18. | 4012 | 4067 | 412 | 417 | 4233 | 4288 | 434 | 439 | 445 | 4508 | 20 |
| 21 | 89 | 8934 |  |  |  |  |  |  |  |  |  | 727 |  |  |  |  |  |  |  |  |  |
| 22 | 842 | 840 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0838 | 089 |  | 22 |
| 23 | 790 | 788 | 785 | 7837 | 7815 | 7794 | 7772 | 775 | 7729 | 21. | $7 \cdot 3614$ |  | 374 | 380 |  | 3931 | 3994 | 40 | 4121 | 418 | 23 |
| 24 | 73 |  |  |  |  |  |  |  |  | 22 |  |  |  | 7013 |  | 145 | 7212 | 7278 |  |  | 24 |
| 25 | 68 | 6826 | 6803 | 6779 | 6756 | 6733 | 6709 | 6686 | 6662 | $23 \cdot 663$ | 8.0015 | 008 | 015 | 022 | 02 | 0360 | 0429 | 0498 | 0566 | 063 | 25 |
| 26 | 632 | 6299 | 6275 | 6250 | 6226 | 6202 | 617 | 6153 | 6129 | 24.6104 | 8.3216 | 3288 | 3359 | 34 | 3503 | 3574 | 3646 | 3717 | 378 | 3861 | 26 |
| 27 | 5797 | 577 | 574 |  |  |  |  |  |  | 25 |  |  | 65 | 66 |  |  |  | 6937 |  |  | 27 |
| 28 | 527 |  |  |  | S167 | 1010 |  |  | 5062 | $26 \cdot 5$ |  | 9694 | 97 | 9849 |  | P003 | 0080 | 015 | 23 | 312 | 28 |
| 29 | 474 | 47 | 469 | 4664 | 4637 | 10 | 458 | 4555 | 4528 | 27 |  | 2898 | 2978 | 30 | 3138 | 3217 | 3297 | 337 |  |  | 29 |
| 30 | 4219 | 419 | 4163 | 4135 | 07 | 4079 | 4051 | 4023 | 3995 | 28.3 | 9.6019 | 61 | 618 | 62 | 6349 | 643 | 651 | 6597 | 6680 | 6762 | 30 |
| 31 | 3693 | 3664 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 31 | 313 |  |  |  |  |  |  |  |  | 10.24 |  |  |  |  |  |  | 303 |  |  | 32 |
| 33 | 26 | 2610 | 25 | 2549 | 2518 | 2487 | 2456 | 2425 | 2394 | 31 | 10 | 571 | 5802 | 5893 |  | 6075 | 616 | 625 | 6348 | 643 | 33 |
| 34 | 21 |  |  |  |  |  |  |  |  | $32 \cdot 1$ | 10 |  |  |  |  | 9289 |  | 947 |  |  | 34 |
| 35 | 15 | 155 | 1524 |  | 1458 | 1426 | 1393 |  | 1327 | $3 \cdot 1$ |  |  | 2215 |  |  | 2504 | 600 | 2697 | 279 | 88 | 35 |
| 36 | 106 | 1029 | 0996 | 0962 | 0928 | 0895 | 086 | 0827 | 0794 | 34．0760 | 11.5222 | 532 | 542 | 552 | 5619 | 5718 | 5817 | 591 | 6016 | 6115 | 36 |
| 37 | 05 | 050 |  |  |  |  |  |  |  |  |  |  | 862 |  |  |  |  |  | 238 |  | 37 |
| 38 | 101 |  |  |  | 986 | 983 |  |  | 9727 |  |  |  | 1833 |  |  |  |  |  | 2461 |  | 38 |
| 39 | 948 | 944 |  |  |  |  | 926 |  | 9193 | 36 | 12 | 49 | 503 | 5147 | 5254 | 536 | 546 | 5576 | 5684 |  | 39 |
| 40 | 89 | 8921 | 8884 | 8847 | 8809 | 8772 | 8735 | 8697 | 8660 | 37 | $12 \cdot 8025$ | 813 | 824 | 83 | 8466 | 85 | 8686 | 87 | 8906 | 9016 | 40 |
| 4 | 8433 |  |  |  |  |  |  |  |  |  | $13 \cdot 1225$ |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 79 | 786 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 738 | 73 | 7300 | 7260 | 7220 |  |  |  |  | 40 | 13 |  |  |  | 8101 | 82 | 83 |  | 8574 |  |  |
| 44 | 685 | 6814 | 67 | 6731 |  | 6649 |  | 6567 | 6526 | $41^{\circ}$ | 14 |  | 1070 | 11 | 1312 | 1433 | 15 |  |  | 191 | 44 |
| 45 | 632 | 628 | 62 |  | 61 | 6119 | 6076 | 6034 |  |  | $14 \cdot 40$ | 415 | 42 | 44 | 452 | 464 | 47 | 489 | 5020 | 5143 | 45 |
| 46 | 580 | 576 |  |  |  |  |  |  |  |  |  |  | 74 |  |  |  |  |  |  |  | 46 |
| 47 | 52 | 523 | 5189 |  | 5101 | 505 |  |  |  | $44 \cdot 48$ | 15 |  |  |  |  |  |  |  |  |  | 47 |
| 48 | 47 | 47 | 4661 | 4616 | 4571 | 45 | 448 |  | 439 | 45 | 15 |  |  |  | 4159 |  |  |  |  |  | 48 |
| 49 | 422 |  |  |  | 4042 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 49 |
| 50 | 369 | 36 | 3605 | 3559 | 35 | 3465 | 3418 | 3372 | 3325 | 47 | $16 \cdot 003$ | 0169 | 03 | 0 | 05 | 072 | 0857 | 0995 | 1133 | 127 | 50 |
| 51 | 3172 |  |  |  | 2982 | 2934 | 288 |  |  | $48^{\prime 27}$ |  |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 264 | 25 | 2549 | 2501 | 2452 | 240 | 2355 |  | 2258 | $49^{\prime 2}$ | 16. |  |  |  |  |  |  |  |  |  |  |
| 53 | 21 | 207 | 2021 | 1972 |  |  | 1823 |  | 24 | $50 \cdot 16$ |  |  |  |  | 02 |  |  |  |  |  |  |
| 54 |  |  |  |  | 1393 |  |  |  | 1191 | $51^{\circ}$ | 17 |  |  |  |  | 3577 |  |  | 023 | 47 | 54 |
| 55 | 106 | 10 |  |  |  | 081 |  |  | 0657 | 52 | $17 \cdot 6034$ | 61 | 633 |  | 6640 | 6792 |  |  |  |  | 55 |
| 56 | 05 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 10 |  |  |  |  |  |  |  |  | 53.95 | 18 |  |  |  |  |  |  |  |  |  |  |
| 58 | 94 | 943 | 9382 | 9328 | 9274 | 92 | 9165 | 9111 | 9057 | 54.90 |  |  |  | 61 | 627 | 643 | 659 |  | 6914 |  | 58 |
| 59 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5 |
| 60 | 8438 | 838 | 8326 | 8270 | 8214 | 8158 | 8102 | 8046 |  | $56 \cdot 7933$ | 19.2037 | 22 | 23 | 2533 | 2698 | 2864 |  | 3194 | 3359 | 352 | 60 |
|  | 791 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 61 |
| 62 | 73 | 732 | 7270 |  |  | 709 | 7039 |  |  | 58.68 | 19.8438 |  |  |  |  |  |  |  |  |  |  |
| 63 | 68 |  |  |  |  |  |  |  |  |  | $20 \cdot 16$ |  |  |  |  |  |  |  |  |  |  |
| 64 | 633 | 6274 |  |  |  |  | 5975 | 5916 | 585 | $60 \cdot 5$ | 20．48 |  | 5192 |  |  | 57 |  |  |  | 642 |  |
| 65 | 58 | 5747 |  |  |  | 550 |  | 5383 | 5322 | ． 5 | $20 \cdot 8$ | 82 | 83 | 8578 | 875 | 8936 |  | 92 |  |  | 65 |
| 66 | 528 |  |  |  |  |  |  |  |  |  | $21 \cdot 124$ | 123 |  |  |  |  |  |  |  |  |  |
| 6 | 47 |  |  |  |  |  |  |  | 55 | ， |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 423 | 41 | 4103 | 4040 | 397 | 391 | 384 | 3785 | 3722 | 64：36 |  |  |  |  | 839 | 859 |  |  |  |  |  |
| 69 | 370 | 36 |  |  |  |  |  |  | 3188 | 65.3 | 22.084 | 103 | 122 | 14 | 1603 | 179 |  | － |  |  |  |
| 70 | 317 | 31 | 3047 |  | 291 |  | 278 |  |  | ．25 | $\underline{22.4043}$ | 4236 | 442 | 4622 | 硣 | 㖪 |  |  |  | 577 | 70 |
| 71 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 212 | 20 | 19 | 1924 | 185 | 17 | 172 | 1655 | 1587 | $68 \%$ | 23.04 |  |  | 10 | 1238 | 143 | 163 | 1833 |  | 223 | 72 |
| 73 | 160 |  | 1464 |  |  |  |  | 22 | 1054 | 69.09 |  |  | 40 |  | 445 | 46 |  |  |  |  | 73 |
| 74 | 107 |  |  |  |  |  |  |  | 0520 | 70.0 |  |  | 7254 |  | 矿 | 786 |  |  |  |  | 74 |
| 75 | 054 | 0478 | 0408 | 0338 |  |  | 0127 |  |  | 70 | 24.004 | 025 | 046 | 0666 | 087 | 108 | 128 | 1493 | 1699 | 19 | 75 |
| 76 | 10 | 9951 |  |  |  |  |  |  | 9453 | 71.93 | $24 \cdot 32$ |  | 36 |  | 40 | 429 |  | 4713 |  |  |  |
| 77 |  |  |  |  |  |  |  |  | ， |  |  |  |  |  |  | 硡 |  |  |  |  |  |
| 78 | 896 | 88 | 8824 | 8751 | 867 | 860 | 8533 | 8460 | 8386 | $73 \cdot 8313$ | 24 | 98 | －078 | 0293 | 050 | 072 | 093 | 115 | 136 | 15 | 78 |
| 79 | 844 | 8370 | 8296 | 22 | 8149 | 8075 | 8001 | 927 |  | 74.717 | 25.284 | 306 | 3284 | 3502 | 372 | 393 | 415 | 437 | 459 | 480 | 79 |
| 80 | 7917 |  |  | 7694 |  | 7544 | 7469 | 7394 | 7319 | 75．724 | 25.6050 |  |  | 67 |  | 75 |  |  | 781 | 803 | 80 |
| 81 | 739 |  |  |  |  | 7013 | 6938 |  | 6786 |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 686 | 678 | 67 | 6636 | 65 | 6483 | 6406 | 6329 | 625 | 77．61 | 26.245 | 263 | 29 | 312 | 335 | 35 |  | 4032 |  |  | 82 |
|  | 63 | 6262 |  | 6107 | 6030 | 592 |  |  | 5 | $78 \cdot 56$ |  |  |  |  | 656 | 寿 | 702 |  |  |  |  |
| 84 | 5813 | 5735 | 5657 | 557 | 55 | 542 | 53 | 5264 | 5185 | 79.51 | 26.885 | 908 | 93 | 9546 | 9778 | －009 | 024 | 047 | 0703 | 093 | 84 |
| 85 | 52 | 5208 | 5129 |  |  |  |  |  | 4652 | 80.457 | 7205 | 228 | 25 | 2755 | 298 | 322 | 34 | 36 | 392 | 416 | 85 |
| 86 | 47 |  |  |  |  |  |  |  | 4118 |  |  |  |  |  |  |  |  |  |  |  |  |
| 87 | 423 |  | ， | 3992 | 3911 | 3829 | 3748 | 3134 | 3585 | ${ }^{2} 2$ | 27 | － | 813 | 9173 | 2013 | 965 |  | －132 |  |  |  |
| 88 | 3709 | 362 | 35 | 3463 | 338 | 3298 | 3216 | 3134 | 305 | 83.296 | 28.165 | 189 | 213 | 238 | 262 | 286 | 310 | 33 | 35 |  | 88 |
| 89 | 3183 |  | ， |  | 2851 | 2768 | 涯 | 230 | 2518 | 84.243 | 85 | 5100 | 534 | 5391 | 5836 |  |  |  | 6816 |  |  |
| 90 | 2657 | 2573 | 2489 | 405 | 2321 | 2237 | 2153 | 2069 | 1984 | 85．1900 | $28 \cdot 805$ | 830 | 855 | 8800 | 9048 | 29 | 954 | 979 | ＋03 | 02 | 90 |
| 91 | 21 |  |  | 1876 | 1791 | 1706 | 1621 | 1536 | 1451 | $86 \cdot 136$ | 29.125 | 150 | 17 | 20 | 22 | 251 | 27 | 301 | ， |  |  |
|  | 16 | 1 | 143 | 1348 | 1262 | 1176 | 1090 | 1004 | 0917 | 87.083 | 29 | 4710 | 496 | 521 | 54 | 570 | 597 | 623 | 648 |  |  |
| 93 | 1079 | 㖪 |  | 8819 | 07 | 0645 | 558 | 0471 | 0384 | 88.029 | 29.765 | 21 | 813 | 842 | d683 | 893 | 919 | 945 | 970 |  |  |
| 94 | 0553 | 0465 | 0378 | 0290 | 0202 | 0114 | ＋026 | 9938 | 9850 | 88 | 30．0858 | 11 | 13 | 16 | 189 | 215 | 24 | 2671 | 2930 |  | 94 |
| 95 | ${ }^{+027}$ |  |  |  |  |  |  |  | 9317 |  | $30 \cdot 40$ | 4321 | 4582 | 4844 | 5106 |  | 5629 | 5891 | 6152 |  |  |
|  | 9501 |  |  | 9232 | 143 |  |  |  | 5783 |  |  | 52 |  |  |  |  |  |  |  |  | 96 |
| 97 | 89 |  |  | 8703 | 861 | 8522 | 8432 | 8341 | 825 | 9181 | 31.04 | 07 | 09 | 1262 | 1529 | 179 | 206 | 233 | 25 | 286 |  |
|  | 8449 | 8357 |  | 析 | 8083 |  |  |  | 7716 | 92．762 | ＇366 | 3931 | 420 | 4 | 474 | 50 | 5281 | 5550 | 5820 | 609 | 98 |
|  |  |  |  |  |  |  |  | 7276 | 7183 | $93 \cdot 7090$ | 31.686 | 7134 | 7407 | 680 | 7952 | 822 | 8498 |  |  |  | 99 |
| 100 | 3397 | 7304 | 7210 | 7117 | 7024 | 6930 | 6837 | 6743 | 6649 | 94.6556 | 32.0062 | 0337 | 0613 | 0889 | 1164 | 1440 | 1715 | 1990 | 2266 | 254 | 100 |
|  | $20^{\prime}$ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | 16 | 15 | $14^{\prime}$ | 13 | $12^{\prime}$ | $11^{\prime}$ | $20^{\prime}$ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | 15 | $14^{\prime}$ | $13^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $71^{\circ}$ |

TRAVERSE TABLES．

| $18^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $18^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | 52 | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | $56^{\prime}$ | $57^{\prime}$ | $58^{\prime}$ | 59 | $50^{\prime}$ | $51^{\prime}$ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ |  |  |  |  |  |  |
|  | ${ }^{9465}$ | ${ }^{9464}$ | 946 | 2 | 9461 | 9460 | 9459 | 9458 |  |  | 3228 <br> .6456 | $\begin{aligned} & 3231 \\ & 64662 \end{aligned}$ | $\begin{aligned} & 3234 \\ & 6467 \end{aligned}$ | $\begin{aligned} & 3236 \\ & 6473 \\ & 646 \end{aligned}$ | $\begin{array}{\|l\|l\|} \hline 3239 \\ 6478 \end{array}$ | $3242$ | $\begin{aligned} & 245 \\ & 489 \\ & 48 \end{aligned}$ | $\begin{aligned} & 247 \\ & 495 \end{aligned}$ | $\begin{aligned} & 3250 \\ & 6500 \end{aligned}$ |  |  |
|  | 839 | ${ }_{8391}^{8927}$ | 83 | 8924 | ${ }_{8383}^{8922}$ |  | 8377 | 374 | 8371 | 1．89 | 6456 .9684 | $\left\lvert\, \begin{aligned} & 6462 \\ & 9693 \end{aligned}\right.$ | $467$ | $\begin{aligned} & 643 \\ & 9709 \end{aligned}$ | $\begin{array}{\|l\|l\|} \hline 6478 \\ 9718 \end{array}$ | $484$ | $489$ | $\begin{aligned} & 95 \\ & 42 \end{aligned}$ | 6500 |  |  |
|  | ${ }_{4}{ }^{4} 88588$ | ${ }_{78,5}^{839}$ | 8388 78 | ${ }_{7847} 838$ |  |  |  | ${ }_{7832} 8$ | 7828 | 287825 3 | 129 | 2924 | 29 | 2946 | 2957 | 58 | 9 | 2990 | 3001 | 30 |  |
| 5 | 723 | 7318 | 7314 |  | 7304 | 7300 | 7295 | 729 | 7285 | 4728 | 1.6141 | 615 | 616 | 6182 | 6196 | 6210 | 6223 | 623 | 6251 | 6265 |  |
| 6 | 88 | 6782 | 6776 | 677 | 67 | 6759 | 6754 | 6748 | 67 | 5.673 | 1.93 | 9386 | 9402 | 19 | 9435 | 942 | 88 | 9485 | 9501 | 9518 |  |
|  |  | 6246 | 6239 | 623 | 62 | 6219 | 6213 |  | 620 | － | $2 \cdot 2$ |  | 26 | 2655 | 267 | 93 | 13 | 2732 | 27 |  |  |
|  | ${ }^{8} 5717$ | 5173 | 5702 | 5694 |  |  | 5672 | 5664 | 514 |  | 2.5 | 78 |  | 5891 | 5913 | 5935 |  |  |  |  |  |
|  | 5182 | 5173 | 5165 | 5156 | 5148 | 51 | 5131 | 5122 | 5114 | 8.5105 | 2.92 | 9078 | 910 | 9128 | 9153 | 9177 |  | $9227$ | $\left\lvert\, \begin{array}{\|c\|c\|} \hline 9252 \\ 0502 \end{array}\right.$ |  |  |
| 10 |  |  |  |  |  |  | O | 30 | 4028 |  | 3．22 |  | 2337 | 34 | 2392 | 2419 |  | 4 |  |  | 0 |
| 11 | 4111 | $\begin{aligned} & 4100 \\ & 3564 \end{aligned}$ | $\left\lvert\, \begin{aligned} & 4090 \\ & 3553 \end{aligned}\right.$ | $\begin{aligned} & 4080 \\ & 3542 \end{aligned}$ | ${ }_{3530}^{4069}$ | $\left\lvert\, \begin{array}{r} 4059 \\ 3519 \end{array}\right.$ | $\begin{aligned} & 4049 \\ & 3508 \end{aligned}$ | $\begin{aligned} & 4038 \\ & 3496 \end{aligned}$ | $\begin{aligned} & 4028 \\ & 3485 \end{aligned}$ | $\left\lvert\, \begin{aligned} & 10.4017 \\ & 11.3474 \end{aligned}\right.$ | $\begin{array}{r} 3.5510 \\ 3.8738 \end{array}$ | $8540$ | $5570$ | $5601.5837$ | $\left\lvert\, \begin{aligned} & 5631 \\ & 8870 \end{aligned}\right.$ | ${ }_{8903}^{5661}$ | 36 |  | 52 |  | 12 |
|  | 3040 | 30 | 3016 |  | 2991 |  | 2967 | 2954 | 2942 | 12.2930 | $4 \cdot 1966$ | 2002 | 2038 | 2073 | 2109 | 2145 | 2181 | 2217 | 2252 | 2288 | 13 |
|  |  |  |  |  | 2452 |  | 2426 |  | 23 | 13.23 | 4.5194 | 523 | 527 | 5310 | 5348 | 5387 |  | 54 |  | 554 | 14 |
| 15 | 969 | 1955 | 194 | 1927 | 1913 | 1899 | 85 | 1870 | 1856 | 14.18 | 4.8422 | 846 | 850 | 854 | 858 | 86 | 86 | 87 | 87 | 8794 | 15 |
| 16 | 1434 | 1419 | 140 | 13 | 13 |  |  | 13 |  | $15 \cdot 129$ | $5 \cdot 1$ | 16 |  | 178 | 1827 | 1871 | 1915 | 硡 | 20 | 2047 | 16 |
| 17 |  |  |  | 08 | 108 | 08 | 0802 |  | 0770 | $16^{\circ}$ | 54．4879 | 49 |  |  |  | 51 |  |  |  |  | 17 |
| 18 | 36 | 0346 | 032 | ¢ | 23 |  | 51 | 0244 | 0227 | 17 |  | 815 | 820 | 8256 | 8305 | 835 |  | 84 | 85 |  | 18 |
| 19 | 9828 | 98 | 979 |  | 9756 | 9738 |  |  | 9684 |  | 6.13 | 138 | 144 | 1492 | 1544 | 159 | 1649 | 1701 | 175 |  | 19 |
| 20 | 9292 | 927 | 225 | ， | 析 | 9198 | 9179 | 9160 | 9142 | 18.9123 | 6.4563 | 4618 | 4673 | 4728 | 4783 | 483 | 4894 | 4949 | 5004 |  |  |
| 21 | 8757 | 8737 | 8717 | 8698 | 8678 | 8658 | 8638 | 8618 | 8599 | 19.857 | 6.779 | 7849 | 79 | 796 | 8023 | 808 | 813 | 819 | 8254 | 8312 | 21 |
| 22 |  | 820 | 8180 | 8150 | 8139 | 8118 | 8097 | 8077 | 8056 | $20 \cdot 8$ | 7110 | 108 | 114 | 1201 | 1262 | 132 |  | 14 | 15 |  | 22 |
| 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{23}$ |
| 24 | 66 | ${ }_{6} 7128$ | 6568 | 7083 | 652 | 7038 6498 | $6474$ | 6451 | 6427 | ${ }_{23 \cdot 6}^{22.6}$ | 7.7476 8.0704 |  | $108$ | $7674$ |  | $104$ | 111 |  | $125$ | 8070 <br> 1323 | 24 <br> 24 |
| 26 | 6080 | 6056 | 6031 | 60 |  | 595 | 5933 | 5909 | 5884 | 24 | $8 \cdot 3932$ | 400 | 40 |  |  |  | 43 |  |  | 45 |  |
| 27 |  | 5519 | 5494 | 54 |  | 54 | 5392 | 5367 | 5341 | $25 \cdot 5$ | 8 | 723 | 73 | 7383 | 7458 | 753 |  |  |  |  | 27 |
| 28 |  | 4983 | 4957 |  |  | 48 | 4851 | 4825 | 4798 | ${ }_{26 \cdot 47}$ | 9． | 04 | 05 | 0620 | 069 | 077 |  |  | 100 | 1082 | 28 |
| 29 | 44 | 4447 | 4419 | 4392 | 4365 |  | 4310 | 4283 | 4255 | ${ }^{27} 4228$ | 5175 |  | 3776 | 3856 | 36 | 401 | 409 | 417 | 425 |  | 29 |
| 30 |  | 3910 | 3882 | 3854 | 3826 | 3797 | 3769 | 3741 | 3712 | $28 \cdot 3684$ | 6845 | 69 | 7010 | 7093 | 7175 | 7258 | 7340 | 7423 | 7505 |  | 30 |
| 31 | 3403 | 3374 | 3345 | 3316 | 3286 | 325 | 3228 | 199 | 3169 | 29.314 | $10 \cdot 0073$ | 01 | 0244 | 0329 | 041 | 050 | 0585 |  | 0756 |  |  |
| 32 |  | 283 | 280 | 277 | 2747 | 2717 | 26 | 265 | 2626 | $30^{\circ} 2$ | 10.33 |  | 347 |  | 3654 | 374 |  |  |  |  | 32 |
| 33 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 33 |
| 34 |  | 17 | 173 | 1701 | 1669 | 163 |  | 1573 | 1541 |  | 10 |  |  | －038 | 0132 | 02 | 03 |  |  |  | 34 |
| 35 | 126 | 12 |  |  |  |  |  | 1031 | 0998 |  |  |  | 3178 | 3275 | 33 | 3467 |  |  |  |  |  |
| 36 | 072 | 069 | 0658 | 0625 | 05 |  | 0523 | 0489 | 0455 | 34：0421 | 11. | 6313 | 6412 | 6511 |  |  | 6808 |  |  |  | ${ }^{36}$ |
| 37 | 019 | 01 | 01 |  | 0052 | 017 | 282 |  | 9912 |  |  | 2775 |  |  |  |  |  |  | 025 | ${ }^{0358}$ | 37 |
| 38 |  |  |  | 9548 | 9512 | 9477 | 9441 | 9405 | 硡 | $35^{\circ} 9333$ | 12.2670 | 277 | 61 | 2984 | 3089 | 319 |  |  |  |  | 38 |
| 39 |  |  |  |  | 8973 | 893 | 0 | 8863 | 8826 | 36．878 | 12.5898 | 600 | 611 | 6220 | 6328 | 643 | 65 | 66 | 67 |  | 39 |
| 40 | 85 | 8547 |  | 8472 | 8434 | 839 | 835 |  | 8283 | 824. | 12.91 | 9237 | 9347 | 945 | 9567 |  | 97 | 9897 | ${ }^{+007}$ |  | 40 |
| 41 | 8049 | 8011 | 7972 | 79 | 78 | 78 | 781 | 77 | 77 | ${ }^{38} 7$ | 13.23 | 24 | 25 | 26 | 2806 |  | ${ }^{3032}$ | 31 |  | 70 |  |
| 42 | 7514 | 747 | 7435 |  |  | 7316 | 7277 | 72 | 71 | 39.7 | 13.5 |  |  |  | 6045 | （1） |  |  |  |  | 42 |
| 43 |  |  |  |  |  |  |  | 6695 | 6654 | 40.6 |  |  |  | 916 | 928 | 94 | 95 | 96 | 97 | 98 | 43 |
| 44 | 64 |  | 63 | 63 | ${ }_{5} 6738$ | 623 | 6195 | 6153 | 6111 |  |  |  | 2281 |  | 2524 | 264 | 27 |  |  |  | 44 |
| 45 |  |  | 58 | 5781 | 5738 |  | 5654 | 5611 | 5569 | 42.552 | 14.5 | 5391 | 5515 | 5639 | 5763 | 5887 | 6011 | 6134 | 6258 |  | 45 |
| 46 | 5372 | 5329 | 5286 | 5243 | 5199 | 5156 | 5113 | 5069 | 5026 | $43 \times 498$ | 14.84 | 862 | 874 | 8875 | 9002 | 9129 | 92 | 93 | 95 | 96 | 46 |
| 47 |  | 4793 | 4749 | 4704 | 46 |  | 4571 | 4527 | 4483 | 44.443 | 15.1724 | 185 | 198 | 2112 | 2241 | 237 | 25 | 26 | 2758 |  |  |
| 48 | 430 | 4256 | 4211 | 4166 | 4121 | 4076 | 4030 | 3985 | 3940 | $45 \cdot 38$ | 15．4952 | 508 | 521 | 5348 | 5480 | 561 | 57 | 58 |  | 61 | 48 |
|  |  |  |  | 36 | 35 | 353 | 34 | 3443 | 3397 |  | 15.8 | 83 | 硅 | 85 | 872 | 885 | 89 | 91 | 92 |  | 49 |
| 50 | 3231 | 3184 | 3137 | 30 | 3043 | 2996 | 2948 | 2901 | 285 | 47. | 16.14 | 1546 | 1684 | 182 | 19 | 209 | 2234 | 2371 | 2509 | 26 | 50 |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 51 |
| 5 |  | 211 | 20 | 20 |  | 1 | 1 | 18 | 1768 | $49 \cdot 1$ |  | 800 | 81 | 829 | 843 | 858 | 87 |  |  | 915 | 52 |
| 53 | 1625 | 157 | 15 | 14 | 14 | 1375 | 1325 | 1275 | 1225 |  | $17 \cdot 1093$ | 123 | 138 | 1530 | 167 | 182 | 196 | 21 | 22 | 240 | 53 |
| 54 |  |  |  |  |  | 08 |  | 0733 | 0682 | 1 | 17.4321 | 447 | 461 | 476 | 4915 | 506 | 52 | 53 |  | 56 | 54 |
| 55 | 0554 | 0502 | Os | 0399 | 0347 | 02 | 0243 | 0191 | 0139 | $52 \cdot 0087$ | 177549 | 770 | 785 | 203 | 8155 | 830 | 84 | 86 |  | 89 | 55 |
| 56 | ＋0 | 996 | 99 | 19861 | 9808 | 9755 | 902 | 9649 | $\mid 9596$ | 52．954 | 18.077 | 10931 | 108 | 1240 | 1394 | 1548 | 170 | 18 | 5 | 21 |  |
| 5 |  | 94 |  | 9322 | 9269 | 9215 | 9161 | 9107 | 9053 | 53.9000 | 18：4005 | 4162 | 431 | 4476 | 4633 | 4790 | 494 | 51 |  |  |  |
| 58 |  |  |  | 87 | 87 | 86 | 86 | 85 | 8511 | 54：84 | 18.72 | 739 | 75 | 77 | 7872 | 803 | 81 | 83 | 85 | 86 | 58 |
|  |  |  |  |  |  | 8135 |  |  |  |  |  | 062 | 078 |  | 111 | 127 | 14 | 15 | 17 |  | 59 |
| 60 | 7877 | 782 | 7764 | 7708 | 765 | 759 | 7538 | 7481 | 74 | 56 | 19 | 3855 | 4020 | 4185 | 435 | 451 | 4681 | 4846 | 5011 | 5176 | 60 |
| 61 |  |  |  |  |  |  |  |  |  |  |  |  |  | 742 |  |  |  |  |  |  | 61 |
| 62 |  | 67 | 665 | 66 | 6573 | 651 | 64 | 639 | 6339 | 58．62 | $20 \cdot 1$ | 031 | 048 | 06 | 082 | 099 | 11 | 13 | 15 |  | 62 |
| 63 |  |  | 61 |  | 60 | 59 |  |  | 5 | 59.5736 | 20．3374 | 3548 | 372 | 389 | 4068 | 4241 | 441 | 458 | 47 | 49 | 63 |
| 64 | 573 |  |  | 55 | 54 | 5434 | 5374 | 5313 | 5253 | 60.5192 | $20 \cdot 6602$ | 677 | 695 | 713 | 7307 | 7483 | 76 | 783 | 80 |  | 64 |
| 65 | 5200 | 51 | 50 | 5017 | 4956 | 4894 | 4833 | 4771 | 4710 | 11－4649 | 20.9831 | 1010 | 188 | 036 | 0546 | 072 | 09 | 10 | 12 | 14 | 65 |
| 66 | 46 | 46 | 45 | 4478 | 4416 | 4354 | ${ }^{4292}$ | 4230 |  | 62.41 | 21．3059 | 3241 | 342 | ${ }^{36}$ |  |  | 414 | 43 | 4512 |  |  |
|  |  |  | 4003 |  | 38 |  |  |  |  | $63 \cdot 35$ | $21 \cdot 62$ | 64 | 66 | 68 | 7025 | 720 | 7393 |  | 77 |  | 67 |
| 68 |  |  |  |  |  |  |  |  |  | 64.3 | $21 \cdot 9$ | 970 | 9 | 40 | O25 | 04 | 038 | 08 | 10 |  | 68 |
| 69 |  |  | 2929 |  |  |  |  |  |  | 192 |  | 2932 | 3123 | 3313 | 03 | 3693 | 3883 |  | 4262 |  | 69 |
| 70 |  | 2457 | 2392 | 232 |  | 2194 | 2128 |  |  | 66．1929 | 22．5971 | 616 | 635 | 6550 | 2 | 69 |  | 7320 | 7513 | 7705 | 70 |
|  |  | 192 | 1854 | 1787 | 1721 | 1654 | 1587 | 152 | 1453 | 67•1385 | 22.9200 | 9395 | 9591 | 978 |  | ＋177 | 10372 | 056 | 07 |  | 71 |
| 73 | 145 | 13 | 1317 | 124 | ${ }^{1}$ | 1 | 1046 | 978 | 10 | 68.842 | 23.2428 | 2626 | 2824 | 302 | 3221 | 3419 | 3617 | ， | 4013 | 4 | 72 |
| 73 | 09 | 08 | 0780 | 07 | 06 | 0574 | 05 | 043 | 0367 | 69．029 | 23.5656 | 58 | 60 | 625 | 64 | 6661 | 686 | 706 | 726 | 746 | 73 |
| 74 |  | 03 |  |  |  |  | 9964 |  | 98 | 69.975 | $23 \cdot 88$ | 908 | 92 | 949 | 969 |  | ＋10 | 03 | 05 | 07 | 74 |
| 75 | 984 | 977 | 9705 | 9635 | 9564 | 9493 | 94 | 9352 | 928 | 70.92 |  | 231 | 2525 | 2732 | 2938 | 3144 | 335 | 3557 | 37 |  | 75 |
|  | 9 | 923 |  |  | 9025 | ${ }^{\text {a }}$ |  |  | 873 | 7 | 24．53 |  | 5759 | 59 |  | 6386 | 659 |  | 70 | 723 |  |
| 77 | 8775 | 87 |  |  |  | 84 | 8341 | 826 | 819 | 812 |  |  |  |  | ¢ | 9628 | 9840 | ＋ | 02 | 047 | 77 |
| 78 79 | ${ }_{77}^{82}$ | ${ }^{81} 8$ | ${ }^{80}$ | ${ }^{8020}$ | 7947 | 7873 | 7800 | 7726 | 7652 | 73.7578 | 25. | 224 | 2226 | 244 | 2656 | ${ }^{281}$ | 3085 | 329 | 351 |  | 78 |
| 80 | 716 | 7094 | 7556 | 7944 | 6868 | ${ }^{1} 793$ | 617 | 6642 | 6566 | 74.7034 75.6491 | ${ }_{25}^{25 \cdot 5025}{ }^{2}$ | ${ }_{8473}^{5242}$ | 8694 | ${ }_{8914}^{5677}$ | 9134 | ${ }_{9354}^{6112}$ | 9574 | 9794 | ＋014 | 0234 | 79 <br> 80 |
|  |  |  | 6482 | 6405 | 6329 | 6253 | 6176 | 6100 | 6023 | 76．5947 | 26．1481 | 1704 | 1927 | 215 | 12373 | 2596 | 2819 | 304 | 32 |  |  |
| 82 | 60 | 60 | 5 | 5867 | 52 | 57 | 56 | 555 | 548 | 77.540 | 26－47 | 4935 | 516 | 538 | 56 | 5838 | 6064 | 6289 | 65 |  |  |
| 83 | 556 | 5485 | 540 | 5329 | 5251 | 517 | 50 | 501 | 493 | 78.48 | $26 \cdot 79$ | 81 | 835 | 86 | 88 | 9080 | 93 | 95 | 97 | 9 | 83 |
| －84 8 | 4492 |  | 4870 |  |  |  | 4553 | 44 | 43 | 79 |  |  | 1628 |  |  |  | 25 | 2784 |  |  |  |
| 87 | 3422 | 336 | 3258 | 317 | 3094 | 3012 | 2930 | 284 | 276 | 82.268 | $28^{\circ} 08$ | 109 | 132 | 156 | 180 | 204 | 228 | 2526 | 276 |  | ${ }_{87}^{86}$ |
|  | 28 | 28 | 27 |  | 25 | 24 |  | 236 | 2223 | 83.2140 | 28•4078 | 4321 | 4563 | 480 | 504 | 528 | 5332 | 5774 | 60 | 62 | 88 |
| 89 |  |  | 2184 |  |  |  |  | 1764 | 1680 | 84．1596 | 28.7307 | 7552 | 7797 |  | 828 | 8531 | 8776 | 9021 |  |  | 89 |
| －90 | 1815 | 17 | 164 | 1562 | 147 | 1392 | 1307 | 1222 | 1137 | $85 \cdot 1052$ | 29.0535 | 0783 | 1030 | 1278 | 152 | 1773 | 2021 | 2269 | 25 | 276 | 90 |
|  | 1280 | ${ }_{0658}^{1195}$ | 11 | 1023 | 0938 | 0852 | 076 | ${ }^{0680}$ | 0594 |  |  | 4013 | 426 | 451 | 476 |  |  |  |  |  | 91 |
|  |  | 01 | 5 | 9485 |  | 03172 |  | 013 | 05 |  |  |  |  |  |  |  |  |  |  |  | 2 |
| 94 |  | O1 |  | 9440 | 9320 |  |  |  |  |  |  |  | 39 |  |  | 1494 |  |  |  |  |  |
| 95 | 9139 | 9049 | 8960 | 8871 | 8781 | 8692 | 86 | 8512 | 84 | 89：8333 | 30 | 693 | 7199 | 7460 | 7722 | 7983 | 8244 | 56 | 矿 |  | 95 |
| 96 | 860 | 85 | 842 | 8332 | ${ }_{7242}^{824}$ | ${ }^{8151}$ | ${ }^{8061}$ |  |  |  |  | ＋168 | 0432 | －0697 | 10961 | 12 | 1489 | 1753 | 2017 | 22 |  |
|  | 8068 |  | 7885 |  |  | 761 | 7520 | 7428 | 7337 | 91. |  | 33 | 3666 | 3933 | 42 |  | 4734 | 5001 | 5267 | 553 |  |
|  | 7539 |  |  |  |  | 7071 | 6979 | 6886 | 6794 | $92^{6} 67$ | 31.6360 | 663 | 6900 | 716 | 7439 | 770 | 7978 | 48 | 8518 | 8787 | 98 |
| 100 | 6462 | 6368 | 6274 | 6180 | 85 | 991 | 5897 | ${ }^{6334}$ | ${ }^{6} 6251$ | 93.6157 94.5613 | ［ 31.9588 | 3092 | ${ }_{3367}^{1133}$ | 0406 3642 | 0678 3917 | 10951 | 1223 | 4743 | 1768 5018 | 293 |  |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime \prime}$ | $2^{\prime}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | Sin |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.

| $19^{\circ}$ |  |  |  |  | Cosine. |  |  |  |  |  | Sinf. |  |  |  |  |  |  |  |  |  | $19^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11^{\prime}$ | $12^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ | $17^{\prime}$ | $18^{\prime}$ | $19^{\prime}$ | $10^{\prime}$ | 11 | 12 | 13 | $14^{\prime}$ | $15^{\prime}$ | 16 | 17 | 18 | $19^{\prime}$ |  |
| 1 | 944 | 9445 | 9444 | 94 | 9442 | 9441 | 9440 | 9439 | 9438 | 9437 | 3283 | 3286 | 3289 | 3291 | 3294 | 3297 | 3300 | 3302 | 3305 | 3308 |  |
| 2 | 8891 | 8889 | 8888 | 8886 | 8884 | 8882 | 8880 | 8878 | 8876 | 1.8874 | 6566 | 6572 | 6577 | 6583 | 6588 | 6594 | 6599 | 05 | 6610 | 66 |  |
| 3 | 8337 | 8334 | 8331 | 8328 | 8326 | 8323 | 8320 | 8317 | 8314 | 2.8311 | 9850 | 9858 | 9866 | 9874 | 9882 | 9891 | 9899 | 9907 | 99 | 9924 |  |
| 4 | 7783 | 7779 | 7775 | 7771 | 7767 | 7764 | 7760 | 7756 | 7752 | 3.7748 | '3133 | 3144 | 3155 | 3166 | 3177 | 3188 | 3199 | 3210 | 3221 | 3232 |  |
| 5 | 7228 | 7224 | 7219 | 7214 | 209 | 7204 | 7200 | 7195 | 7190 | 4.7185 | 1.6416 | 6430 | 6443 | 57 | 647 | 6485 | 6498 | 6512 | 6526 | 6539 | 5 |
| 6 | 6674 | 6668 | 6663 | 6657 | 6651 | 6645 | 640 | 6634 | 6628 | 5.662 | 1.9699 | 97 | 97 | 9748 | 9765 | 9781 | 1788 | 9814 | 9831 | 9847 |  |
| 7 | 6120 | 6113 | 6106 | 6100 | 6093 | 6086 | 6080 | 6073 | 6066 | $6 \cdot 605$ | 2.2982 | 3001 | 3021 | 304 | 3059 | 3078 | 3098 | 311 | 31 | 3155 |  |
| 8 | 5565 | 5558 | 5550 | 5542 | 5535 | 5527 | 5519 | 5512 | 5504 | 7.5496 | $2 \cdot 6265$ | 6287 | 6309 | 6331 | 6353 | 6375 | 6397 | 641 | 644 | 6463 |  |
| 9 | 5011 | 5002 | 4994 | 4985 | 4977 | 4968 | 4959 | 4951 | 4942 | 8.4933 | 2.9549 | 9573 | 9598 | 962 | 9647 | 9672 | 9697 | 972 | 974 | 9771 |  |
| 10 | 4457 | 4447 | 4438 | 4428 | 4418 | 4409 | 4399 | 4390 | 4380 | 9.4370 | $3 \cdot 2832$ | 2859 | 2887 | 2914 | 2942 | 2969 | 2997 | 3024 | 305 | 3079 | 10 |
| 11 | 390 | 389 | 388 | 387 | 3860 | 38 | 38 | 3829 | 3818 | 10.3808 | 3.6115 | 6145 | 61 | 6206 | 6236 | 6266 | 6296 | 6326 | 63 | 6387 | 1 |
| 12 | 3348 | 3337 | 3325 | 3314 | 3302 | 3291 | 3279 | 3268 | 3256 | 11.3245 | 3.9398 | 9431 | 9464 | 949 | 9530 | 9563 | 959 | 96 | 96 | 9695 | 12 |
| 13 | 2794 | 2781 | 2769 | 2756 | 2744 | 2732 | 2719 | 270 | 2694 | 12.2682 | $4 \cdot 2681$ | 2717 | 27 | 278 | 2824 | 2860 | 289 | 293 | 29 | 3003 | 13 |
| 14 | 2239 | 2226 | 2213 | 2199 | 2186 | 2172 | 2159 | 2146 | 2132 | 13.2 | 4.5964 | 60 | 60 | 6080 | 6118 | 6157 | 619 | 623 | 627 | 6310 | 14 |
| 15 | 1685 | 167 | 1656 | 42 | 28 | 1613 | 1599 | 1585 | 1570 | $14 \cdot 1556$ | $4 \cdot 9248$ | 9289 | 9330 | 937 | 9412 | 54 | 9495 | 9536 | 9577 | 9618 | 15 |
| 16 | 1131 | 1116 | 1100 | 108 | 1070 | 1054 | 1039 | 1024 | 1008 | 15.09 | 5.2531 | 2575 | 2619 | 2663 | 2707 | 50 | 94 | 2838 | 2882 | 2926 | 16 |
| 17 | 0576 | 0560 | 054 | 052 | 051 | 049 | 0479 | 0463 | 0446 | 16.0430 | 5.58 | 586 | 59 | 59 | 60 | 6047 | 6094 | 6141 | 61 | 6234 | 17 |
| 18 | 0022 | \$005 | 998 | 997 | 9953 | 9936 | 9919 | 9901 | 9884 | 16.9867 | 5.9097 | 9147 | 919 | 9245 | 9295 | 9344 | 9394 | 944 | 9493 | 9542 | 18 |
| 19 | 9468 | 9450 | 9432 | 9413 | 9395 | 9377 | 9359 | 9340 | 9322 | 17.9304 | $6 \cdot 2380$ | 2432 | 248 | 253 | 2589 | 2641 | 2693 | 274 | 2798 | 2850 | 19 |
| 20 | 8914 | 8894 | 8875 | 8856 | 8837 | 8818 | 8799 | 8779 | 8760 | 18.8741 | 6.5663 | 5718 | 5773 | 5828 | 5883 | 5938 | 5993 | 604 | 6103 | 6158 | 20 |
| 21 | 835 | 83 | 83 | 8299 | 8279 | 8259 | 8239 | 8218 | 8198 | 19 | 6.8947 | 9004 | 9062 | 912 | 9177 | 9235 | 929 | 9350 | 9408 | 9466 | 21 |
| 22 | 7805 | 7784 | 776 | 7742 | 7721 | 7700 | 7678 | 7657 | 7636 | 20.7615 | 7.2230 | 2290 | 235 | 241 | 2472 | 2532 | 259 | 265 | 27 | 2774 | 22 |
| 23 | 7251 | 7229 | 7207 | 718 | 7163 | 714 | 7118 | 7096 | 7074 | 21.7052 | 7.5513 | 5576 | 563 | 570 | 5766 | 5829 | 589 | 595 | 60 | 608 | 23 |
| 24 | 6696 | 6673 | 6650 | 6627 | 6604 | 6581 | 6558 | 6535 | 6512 | 22.6489 | 7.8796 | 886 | 892 | 899 | 90 | 9126 | 919 | 92 | 93 | 9389 | 24 |
| 25 | 61 | 6118 | 60 | 70 | 46 | 6022 | 98 | 5974 | 5950 | $23 \cdot 5926$ | 8.2079 | 214 | 221 | 22 | 235 | 2423 | 249 | 25 | 2629 | 2697 | 25 |
| 26 | 5588 | 5563 | 5538 | 5513 | 5488 | 5463 | 5438 | 5413 | 5388 | 24.5363 | 8.5362 | 5434 | 550 | 5577 | 5648 | 5720 | 5791 | 5862 | 5934 | 6005 | 26 |
| 27 | 5033 | 5007 | 4982 | 4956 | 4930 | 4904 | 4878 | 4852 | 4826 | $25 \cdot 48$ | 8.86 | 8720 | 879 | 88 | 8942 | 9016 | 909 | 91 | 9239 | 93 | 27 |
| 28 | 4479 | 4452 | 4425 | 4399 | 4372 | 4345 | 4318 | 4291 | 4264 | 26.4237 | $9 \cdot 1929$ | 2006 | 2083 | 2160 | 2236 | 2313 | 2390 | 2467 | 254 | 2621 | 28 |
| 29 | 3925 | 38 | 3869 | 384) | 3814 | 3786 | 3758 | 3730 | 3702 | $27 \cdot 3674$ | 9.52 | 5292 | 537 | 54 | 5531 | 5610 | 569 | 577 | 58 | 59 | 29 |
| 30 | 3370 | 3342 | 3313 | 3284 | 3255 | 3227 | 3198 | 3169 | 3140 | 28.3111 | 9.8495 | 8578 | 8660 | 8742 | 8825 | 890 | 899 | 907 | 915 | 923 | 30 |
| 31 | 2816 | 2786 | 275 | 272 | 2697 | 2668 | 2638 | 2608 | 2578 | 29.2548 | 10 | 1863 | 1949 | 2034 | 211 | 2204 | ${ }^{228}$ | 2374 | 2459 | 2545 | 31 |
| 32 | 2262 | 2231 | 2200 | 2170 | 2139 | 2108 | 2078 | 2047 | 2016 | 30.19 | 10.5062 | 5149 | 523 | 532 | 5413 | 5501 | 558 | 567 | 5765 | 585 | 32 |
| 33 | 1707 | 1676 | 1644 | 1613 | 1581 | 1549 | 1518 | 1486 | 1454 | 31.142 | 10.8345 | 8435 | 852 | 861 | 8707 | 879 | 888 | 897 | 90 | 9160 | 33 |
| 34 | 1153 | 1120 | 1088 | 10. | 1023 | 0990 | 0958 | 0925 | 0892 | 32.086 | 11.1628 | 172 | 181 | 19 | 2001 | 209 | 218 | 22 | 2375 | 2468 | 34 |
| 35 | 05 | 0565 | 05 | 0498 | 0465 | 0431 | 0398 | 0364 | 30 | 33. | 114911 | 5007 | 5103 | 5199 | 296 | 539 | 548 | 5584 | 5680 | 5776 | 35 |
| 36 | 0044 | -010 | 9976 | 99 | 99 | 72 | 9838 | 9803 | 97 | 33.9734 | 11.8194 | 8293 | 839 | 849 | 859 | 868 | 878 | 8886 | 898 | 908 | 36 |
| 37 | 9490 | 9455 | 9419 | 938 | 9348 | 9313 | 9277 | 9242 | 920 | 34.9 | 12.1477 | 1579 | 168 | 178 | 1884 | 198 | 208 | 218 | 229 | 239 | 37 |
| 38 | 8936 | 8899 | 8863 | 8827 | 8790 | 8754 | 8717 | 8681 | 8644 | 35.8608 | 12.4761 | 4865 | 4969 | 507 | 5178 | 5282 | 538 | 549 | 559 | 5700 | 38 |
| 39 | 8381 | 8344 | 8307 | 8269 | 8232 | 8195 | 8157 | 8120 | 8082 | $36 \cdot 8045$ | 12.8044 | 8151 | 8258 | 8365 | 8472 | 8579 | 8686 | 8794 | 890 | 900 | 39 |
| 40 | 7827 | 7789 | 7751 | 7712 | 7674 | 7636 | 7597 | 7559 | 7520 | 37.7482 | $13 \cdot 1327$ | 1437 | 1547 | 1657 | 1766 | 1876 | 1986 | 209 | 2206 | 2316 | 40 |
| 41 | 72 | 723 | 719 | 7155 | 7116 | 7076 | 7037 | 699 | 6958 | 38.691 | 13.4610 | 4723 | 4835 | 49 | 5061 | 5173 | 5286 | 5398 | 551 | 5623 | 41 |
| 42 | 6718 | 6678 | 6638 | 6598 | 6558 | 6517 | 6477 | 6437 | 6396 | $39 \cdot 63$ | 13.7893 | 8009 | 8124 | 8239 | 8355 | 8470 | 858 | 870 | 88 | 8931 | 42 |
| 43 | 6164 | 6123 | 6082 | 6041 | 6000 | 5958 | 5917 | 5876 | 5834 | 40.5793 | 14.1176 | 1295 | 1413 | 1531 | 1649 | 1767 | 188 | 200 | 212 | 2239 | 43 |
| 44 | 5610 | 5568 | 5526 | 5484 | 5441 | 5399 | 5357 | 5315 | 5272 | 41.5230 | 14.4460 | 4580 | 470 | 482 | 4943 | 506 | 518 | 530 | 542 | 554 | 44 |
| 45 | 50 | 5012 | 4969 | 4926 | 83 | 4840 | 47 | 4754 | 4710 | 42.4667 | 14.7743 | 7866 | 799 | 8114 | 23 | 836 | 84 | 8608 | 8731 | 8855 | 45 |
| 46 | 4501 | 445 | 441 | 4369 | 4325 | 4281 | 423 | 419 | 4148 | 43.4104 | 15.1026 | 1152 | 127 | 1405 | 1531 | 1658 | \|1784 | 1910 | 2037 | 218 | 46 |
| 47 | 394 | 3902 | 385 | 381 | 3767 | 3722 | 367 | 363 | 35 | $44 \times 3$ | 15.4 | 4438 | 456 | 469 | 4826 | 4955 | 508 | 521 | 53 | 5471 | 47 |
| 48 | 3392 | 3347 | 3301 | 3255 | 3209 | 3163 | 3117 | 3071 | 3024 | 45.2978 | 15.7592 | 7724 | 785 | 7988 | 8120 | 8251 | 838 | 851 | 864 | 8779 | 48 |
| 49 | 2838 | 2791 | 2744 | 2698 | 2651 | 2604 | 2557 | 2510 | 2462 | 46.2415 | 16.0875 | 1010 | 1145 | 1279 | 1414 | 1548 | 168 | 181 | 1952 | 208 | 49 |
| 50 | 2284 | 2236 | 2188 | 2140 | 2092 | 2045 | 1997 | 1949 | 1901 | 47.1852 | 16.4159 | 4296 | 4433 | 4571 | 4708 | 4845 | 4983 | 5120 | 5257 | 539 | 50 |
| 51 | 17 | 16 | 163 |  |  | 14 | 143 | 888 | 1339 | $48 \% 1289$ | 16.7442 | 7582 | 77 | 7862 | 8002 | 81 | 82 | 84 |  |  | 51 |
|  | 1175 | 1125 | 1076 | 1026 | 0976 | 0926 | 0876 | 08 | 0777 | 49.0726 | 17.0725 | 0868 | 1011 | 115 | 129 | 1439 | 1582 | 172 | 18 | 2010 | 52 |
| 53 | 0621 | 0570 | 0519 | 0469 | 0418 | 0367 | 0316 | 0265 | 0215 | 50.0164 | $17 \cdot 4008$ | 4154 | 4299 | 4445 | 4590 | 4736 | 488 | 502 | 517 | 531 | 53 |
| 54 | 0066 | -015 | 9963 | 9912 | 9860 | 9808 | 9756 | 9704 | 9653 | 50.9601 | 17.7291 | 7440 | 7588 | 773 | 7885 | 8033 | 8181 | 832 | 847 | 862 | 54 |
| 55 | 9512 | 9460 | 9407 | 54 | 02 | 9249 | 9196 | 43 | 90 | 51.9038 | 18.0574 | 0726 | 0877 | 02 | 1179 | 133 | 148 | 1632 | 178 | 1934 | 55 |
| 56 | 8958 | 8904 | 885 | 879 | 8744 | 690 | 8636 | 858 | 8529 | $52 \cdot 847$ | 18.3 | 4011 | 41 | 4319 | 4473 | 4627 | 478 | 4934 | 8 | 5242 | 56 |
| 57 | 8403 | 834 | 829 | 8240 | 8185 | 813 | 807 | 802 | 7967 | 53.7912 | 18.7141 | 7297 | 7454 | 761 | 7767 | 7924 | 8080 | 823 | 839 | 8550 | 57 |
| 58 | 7849 | 77 | 7738 | 7683 | 7627 | 7572 | 7516 | 7460 | 7405 | 54.7349 | 19.0424 | 0583 | 0743 | 0902 | 1061 | 1221 | 1380 | 1539 | 169 | 1858 | 58 |
| 59 | 7295 | 7238 | 7182 | 26 | O69 | -13 | 6956 | 6899 | 6843 | 55.6786 | 19.3707 | 3869 | 4031 | 4193 | 4355 | 4517 | 468 | 484 | 5003 | 516 | 59 |
| 60 | 67 | 6683 | 6626 | 6568 | 6511 | 6453 | 6396 | 63 | 6281 | 56.6223 | 19.6990 | 7155 | 732 | 7485 | 7650 | 781 | 797 | 814 | 8309 | 8473 | 60 |
| 6 | 6186 | 6128 | 607 | 6011 | 5953 | 5894 | 5836 | 5777 | 5719 | $57 \cdot 5660$ | 20.0273 | 0441 | 0609 | 0776 | 0944 | 1111 | 1279 | 1446 | 161 | 1781 | 61 |
|  | 5632 | 5573 | 5513 | 5454 | 5395 | 5335 | 5276 | 5216 | 5157 | 58.5097 | $20 \cdot 3557$ | 3727 | 3897 | 4068 | 4238 | 4408 | 4578 | 474 | 491 | 5089 | 62 |
| 63 | 5078 | 5017 | 4957 | 4897 | 4836 | 4776 | 4716 | 4655 | 4595 | 59.4534 | 20.684 C | 7013 | 7186 | 7359 | 7532 | 7705 | 7878 | 805 | 822 | 839 | 63 |
| 64 | 4523 | 4462 | 4401 | 4340 | 4278 | 4217 | 4156 | 4094 | 4033 | 60.3971 | 21.0123 | 0299 | 0475 | 0650 | 0826 | 1002 | 1178 | 135 | 152 | 170 | 64 |
| 65 | 3969 | 3907 | 3845 | 3782 | 20 | 58 | 3596 | 533 | 3471 | 61.3408 | $21 \cdot 3406$ | 3585 | 376 | 39 | 4120 | 4299 | 447 | - |  | 5013 | 65 |
| 66 | 3415 | 3352 | 3288 | 322 | 3162 | 3099 | 3035 | 2972 | 2909 | 62.284 | 21.668 | 6871 | 7052 | 硅 | 7415 |  | 777 | 958 |  |  | 66 |
| 67 | 2860 | 2796 | 2732 | 2668 | 2604 | 2540 | 2475 | 2411 | 2347 | 63.2282 | $21 \cdot 9973$ | +157 | 034 | 0525 | 0709 | 0893 | 1077 | 126 | 144 | 1629 | 67 |
| 68 | 230 | 2241 | 2176 | 2111 | 2046 | 1 | 1915 | 1850 | 1785 | 64.1719 | $22 \cdot 3256$ | 3442 | 3629 | 3816 | 4003 | 4190 | 4376 | 4563 | 475 | 4936 | 68 |
| 69 | 1752 | 1686 | 1620 | 1554 | 1488 | 1421 | 1355 | 1289 | 1223 | 65.1156 | 22.6539 | 6728 | 6918 | 7107 | 7297 | 7487 | 7676 | 786 | 805 | 8246 | 69 |
| 70 | 119 | 113 | 10 | 0996 | 0929 | 0862 | 079 | 07 | 0661 | 66.059 | $22 \cdot 9822$ | 10 | 020 | 039 | 059 | 078 | 097 | 116 | 136 | 155 | 70 |
| 71 | 0643 | 0575 | 0507 | 0439 | 0371 | 0303 | 0235 | 0167 | 0099 | $67 \cdot 0030$ | $23 \cdot 3105$ | 3300 | 3495 | 3690 | 3885 | 4080 | 4275 | 4470 | 4665 | 4860 | 71 |
| 72 | 0089 | -020 | 9951 | 9882 | 9813 | 9744 | 9675 | 9606 | 9537 | $67 \cdot 9467$ | 23.6388 | 6586 | 678 | 698 | 7180 | 7377 | 7575 | 777 | 797 | 8168 | 72 |
| 73 | 9534 | 9465 | 9395 | 9325 | 9255 | 9185 | 9115 | 9045 | 8975 | 68.8905 | 23.9672 | 9872 | -073 | 0273 | 0474 | 0674 | 0875 | 1075 | 127 | 1476 | 73 |
| 74 | 8980 | 8909 | 8839 | 8768 | 8697 | 8626 | 8555 | 8484 | 8413 | 69•8342 | 24.2955 | 3158 | 336 | 3565 | 3768 | 3971 | 4174 | 4377 | 4581 | 4784 | 74 |
| 75 | 8426 | 8354 | 8282 | 8211 | 8139 | 8067 | 7995 | 7923 | 7851 | 70.7779 | 24.6238 | 644 | 665 | 68 | 70 | 7268 | 7474 | 768 | 7886 | 8092 | 75 |
| 76 | 7871 | 7799 | 7726 | 7653 | 7581 | 7508 | 7435 | 7362 | 7289 | 71.7216 | 24.9521 | 9730 | 993 | +147 | 0356 | 0565 | 0774 | -9 |  |  | 76 |
| 77 | 7317 | 7243 | 7170 | 7096 | 7022 | 6949 | 6875 | 6801 | 6727 | 72.6653 | 25.2804 | 3016 | 3227 | 3439 | 3650 | 3862 | 4073 | 428 | 4496 | 4707 | 77 |
| 78 | 6763 | 6688 | 6614 | 6539 | 6464 | 6389 | 6315 | 6240 | 6165 | $73 \cdot 6090$ | $25 \cdot 6087$ | 6302 | 6516 | 6730 | 6944 | 7159 | 7373 | 758 | 780 | 8015 | 78 |
| 79 | 6208 | 6133 | 6057 | 5982 | 5906 | 5830 | 5755 | 5679 | 5603 | 74.5527 | 25.9371 | 9588 | 9805 | +022 | 0239 | 0456 | 0673 | 088 | 1106 | 1323 | 79 |
| 80 | 56 | 55 | 550 | 5425 | 348 | 5271 | 519 | 511 | 50 | 75.4964 | $26 \cdot 2654$ | 2874 | 3093 | 3313 | 3533 | 3752 | 3972 | 419 | 441 | 463 | 80 |
| 81 | 5100 | 5022 | 4945 | 4867 | 4790 | 4712 | 4634 | 4557 | 4479 | 76.4401 | 26.5937 | 6159 | 6382 | 6604 | 6827 | 7049 | 7272 | 749 | 771 | 793 | 81 |
| 82 | 4545 | 4467 | 4389 | 4310 | 4232 | 4153 | 4074 | 3996 | 3917 | 77.3838 | $26 \cdot 9221$ | 9445 | 9671 | 989 | -121 | 0346 | 0572 | 079 | 102 | 124 | 82 |
| 83 | 3991 | 3912 | 3832 | 3753 | 3673 | 3594 | 3514 | 3435 | 3355 | 78.3275 | 27-2503 | 2731 | 2959 | 3187 | 3415 | 3643 | 3871 | 409 | 432 | 455 | 82 |
| 84 | 3437 | 3356 | 3276 | 3196 | 3115 | 3035 | 2954 | 2874 | 2793 | 79.2712 | 27.5786 | 6017 | 6248 | 6479 | 6709 | 6940 | 717 | 740 | 7632 | 786 | 84 |
| 85 | 2882 | 280 | 2720 | 26 | 2557 | 2476 | 2394 | 2313 | 2 | 80.2149 | $27 \cdot 9070$ | 303 | 53 | 977 | -004 | 0237 | - | 070 | 09 | 117 | 85 |
| 86 | 2328 | 2246 | 2164 | 2081 | 1999 | 1917 | 1834 | 1752 | 1669 | $81 \cdot 1586$ | 28.2353 | 2589 | 2825 | 3062 | 3298 | 3534 | 3770 | 400 | 424 |  |  |
| 87 | 1774 | 169 | 1607 | 1524 | 1441 | 1357 | 1274 | 1190 | 1107 | 82.1023 | 28.5636 | 5875 | 6114 | 6353 | 6592 | 6831 | 7070 | 730 | 754 | 7786 | 87 |
| 88 | 1219 | 1135 | 1051 | 0967 | 0883 | 0798 | 0714 | 0629 | 0545 | $83 \cdot 0460$ | 28 '8919 | 9161 | 9403 | 9644 | 9886 | +128 | 0369 | 061 | 085 | 109 | 88 |
| 89 | 0665 | 0580 | 0495 | 0410 | 0325 | 0239 | 0154 | +068 | 9983 | 83.9897 | 29-2202 | 2447 | 2691 | 2936 | 3180 | 3425 | 3669 | 3913 | 415 | 440 | 89 |
| 90 | 0111 | -025 | 9939 | 9853 | 9766 | 9680 | 959 | 9507 | 9421 | 84.9334 | 29.5485 | 5733 | 5980 | 6227 | 6474 | 6722 | 6969 | 7216 | 746 | 7710 | 90 |
| 91 | 9556 | 9470 | 9383 | 9295 | 9208 | 9121 | 9034 | 8946 | 8859 | 85.8771 | 29.8769 | 19019 | 9269 | 9519 | 19769 | -018 | 0260 | 0518 | 076 | 1018 | 91 |
| 92 | 9002 | 8914 | 8826 | 8738 | 8650 | 8562 | 8474 | 8385 | 8297 | 86.8208 | 30.2052 | 2305 | 2557 | 2810 | 3063 | 3315 | 3568 | 382 | 407 | 432 | 92 |
| 93 | 8448 | 8359 | 8270 | 8181 | 8092 | 8003 | 7914 | 7824 | 7735 | $87 \cdot 7645$ | 30.5335 | 5590 | 5846 | 6101 | 6357 | 6612 | 6868 | 7123 | 7378 | 7634 | 93 |
| 94 | 7893 | 7804 | 7714 | 7624 | 7534 | 7444 | 7354 | 7263 | 7173 | 88.7083 | $30 \cdot 8618$ | 8876 | 9135 | 9393 | 9651 | 990 | -167 | 042 | 0684 | 0942 | 94 |
| 95 | 7339 | 7248 | 7158 | 7067 | 6976 | 6885 | 6793 | 6702 | 6611 | 89.6520 | 31.1901 | 216 | 242 | 268 | 2945 | 3206 | 3467 | 72 | 3989 | 4249 | 95 |
| 96 | 6785 | 6693 | 6601 | 6509 | 6418 | 6325 | 6233 | 6141 | 6049 | 90.5957 | 31.5185 | 5448 | 5712 | 5976 | 6239 | 6503 | 6767 | 7030 | 29 | 矿 | 96 |
| 97 | 6230 | 6138 | 6045 | 5952 | 5859 | 5766 | 5673 | 5580 | 5487 | 91.5394 | 31.8468 | 8734 | 9001 | 9267 | 9534 | 9800 | -066 | 0333 | 059 | 0865 | 97 |
| 98 | 5676 | 558 | 5489 | 5395 | 5301 | 5207 | 5113 | 5019 | 4925 | 92.4831 | $32 \cdot 1751$ | 2020 | 2289 | 2558 | 2828 | 3097 | 3366 | 3635 | 3904 | 4173 | 98 |
| 99 | 5122 | 5027 | 4933 | 4838 | 4743 | 4648 | 4553 | 4458 | 4363 | $93 \cdot 4268$ | $32 \cdot 5034$ | 5306 | 5578 | 5850 | 6122 | 6394 | 6666 | 6937 | 7209 | 748 | 90 |
| 100 | 4568 | 4472 | 4376 | 4281 | 4185 | 4089 | 3993 | 3897 | 3801 | 94.3705 | 32.8317 | 8592 | 8867 | 9141 | 9416 | 9691 | 9965 | +240 | 0514 | 0789 | 100 |
|  | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | 47 | 46 | 45 | $4!$ | 43 | $4{ }^{2}$ | 41 | $50^{\prime}$ | $49^{\prime}$ | 48 | 47 | $46^{7}$ | $45^{\prime}$ | 44 | $43^{\prime}$ | $42^{\prime}$ | $41^{1}$ |  |
| 70 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $19^{\circ}$ | $9^{\circ} \quad$ Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $19^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | $21^{\prime}$ | $22^{\prime}$ | $23^{1}$ | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 | 28 |  |  | $21^{\prime}$ |  | 23 | $24^{\prime}$ | $25^{\prime}$ | 26 |  |  |  |  |
|  | 94 | 9435 | 9434 | 943 | 943 | 94 | 94 | 94 | 94 | 427 | 331 | 3313 | 3316 | 3319 | 3322 | 3324 | 3327 | 3330 |  |  |  |
|  | 8872 | 8870 | 8868 | 8866 | 886 | 8863 | 8861 | 8859 | 8857 | 1．885 | 析 | 6627 | 6632 |  | 6643 | 6649 | 6654 |  |  |  |  |
| 3 | 8308 | 830 | 830 | 8300 |  | 8294 | 829 | 8288 | 8285 | 2.8282 | 9932 | 9940 | 9948 | 995 | 9965 | 997 | 9981 | 9990 | 9998 | －00 |  |
|  | 7744 | 7740 | 7737 | 7733 | 7729 |  | 7721 |  | 7713 | 3.7710 | 3243 | 3254 | 3264 | 32 | 3286 | 3297 | 3308 | 3319 | 3330 |  |  |
| 5 |  |  |  |  |  |  |  |  |  | 47 |  | 67 | 6581 | 6594 |  | 6622 | 635 | 664 | 666 |  |  |
| 6 | 6617 | 6611 | 6605 | 6599 | 6593 | 6588 | 6582 | 6576 | 6570 | 5 | ． 9864 | 9880 | 9897 | 9913 | 9930 | 9946 | 9963 | 9979 | 9996 | 012 |  |
|  | 6053 | 60 | 603 | 6032 | 60 | 6019 | 60 | 6005 |  |  |  | 319 | 3213 | 323 | 325 | 327 | 329 | 330 | ， |  |  |
|  | 54 |  | 54 |  |  |  | 5442 | 5435 | 542 | 7.541 |  | 65 | 6529 | 65 | 6573 | 6595 | 6617 | 6639 | 6661 | 6683 |  |
|  | 4925 | 4916 | 49 |  | 4890 | 488 | 4873 | 4864 | 485 | 8.48 |  | 9820 | 984 | 9870 | 9894 | 9919 | 9944 | 996 | 99 | －018 |  |
| 10 | 4361 | 4351 | 4342 | 4332 | 4322 | 4313 | 4303 | 4293 | 4284 | 9427 | 3.3106 | 3134 | 316 | 318 | 3216 | 3244 | 3271 | 329 | 仡 | 335 | 0 |
| 11 | 3797 | 3786 | 37 | 376 | 375 |  |  |  | 37 | 10.37 |  | 644 | 647 |  |  |  |  |  |  |  |  |
| 12 | 3233 | 3221 |  |  |  |  |  | 3152 | 3140 | 11.312 | ． 9728 | 9761 | 9793 | 98 | 9859 | 9892 | 9925 | 928 | 99 | ＋02 |  |
| 13 | 2669 | 26 | 2644 | 2631 | 2619 | 2606 | 25 | 2581 | 25 | 12.2 | 38 | 3074 | 31 | 31 | 31 | 321 | 325 | 3288 | 3324 |  | 3 |
| 14 | 2105 | 2 |  |  | 2051 | 2038 | 2024 | 2011 | 997 | 13．198 | － 6349 | 6387 | 6426 | 646 | 650 | 654 | 6579 | 661 | 66 |  |  |
| 15 |  |  |  |  |  |  | 1454 |  | 1425 | 14.1411 | ． 9660 | 9701 | 974 | 9783 | 9824 | 986 | 990 | 994 | 9989 | ＋030 | 15 |
| 16 | 0971 | 0962 | 0947 | 0931 | 0916 | 0900 | 0885 | 0869 | 0854 | $15^{\circ} 08$ | 5.2970 | 3014 | 3058 | 3102 | 3146 | 3190 | 32 | 3277 | 3321 | 3365 | 16 |
| 17 | 0413 | 0397 | 0381 | －3 | 0348 | ， | 0315 |  | 0282 | 16. | 181 | 632 | 637 | 6421 | 64 | 65 | 656 |  | 6654 |  | 17 |
| 18 | 9850 |  |  | 9797 | 9780 | 97 |  |  |  | 16.9 | $5 \cdot 9591$ | 9641 | 969 | 9740 | 97 | 98 | 9888 | 9937 | 9987 | 103 | 18 |
| 19 | 9286 | 9267 | 9249 | 9231 | 12 | 9194 | 9176 | 9157 | 9139 |  | 62902 | 295 | 300 | 3058 | 31 | 31 | 32 | 3267 | 3319 |  | 19 |
| 20 | 8722 | 8702 | 8683 | 8664 | 8645 | 8625 | 86 | 8586 | 8567 | 18.8548 | 213 | 6268 | 6322 | 637 | 643 | 64 | 654 | 659 | 6652 | 6707 | 0 |
| 21 | 8158 | 8138 | 811 | 8097 | 8077 |  |  |  |  | 19 | 6.9523 |  |  |  |  |  |  |  |  |  | 1 |
| 22 | 7594 |  |  |  |  |  |  |  |  | $20 \cdot$ | 2834 |  | 2955 | 3015 |  | 3／36 | 3196 | 325 | 3317 |  | 22 |
| 23 | 7030 | 700 | 6986 | 6963 | 69 | 6919 | 6897 | 6874 | 6852 | 21. | 6145 | 6208 | 62 | 63 | 63 | 64 | 6523 | 65 | 6649 | 6712 | 23 |
| 24 | 6466 |  |  | 6397 | 63 | 6350 | 637 |  | 6281 | $22 \cdot 62$ |  | 95 | 95 | 96 | 97 | 978 | 985 | 9916 |  | 048 | 24 |
| 25 | 5902 | 5878 |  | 5830 |  |  | 575 | 5733 | 5700 |  | ． 2766 | 283 | 290 | 297 | 304 | 31 | 317 | 32 | 3315 | 3383 | 25 |
| 26 | 533 | 5313 | 5288 | 5263 | 5238 | $52 / 3$ | 5188 | 5162 | 5137 | 24.5112 | 8.6076 | 6148 | 6219 | 629 | 63 | 64 | 6505 | 6576 | 6647 | 6718 | 26 |
| 27 | 477 | 4748 | 4722 |  |  | 464 | 461 |  |  | $25 \cdot 45$ |  | 9461 | 953 | 960 |  | 97 |  |  |  |  | 27 |
| 28 | 4210 |  |  | 4129 | 202 | 4075 | 4048 | 4021 | 3994 | $26 \cdot 39$ | 2698 | 2775 | 2851 | 2928 |  | 3082 | 3159 | 3236 | 3312 |  | 28 |
| 29 | 3646 | 3619 | 359 | 3563 | 3535 | 3507 | 3478 | 250 | 3422 | $27 \cdot 339$ |  | 6088 | 6168 | 6247 | 6327 | 640 |  |  | 6645 |  | 29 |
| 30 | 3083 | 3054 | 3025 | 2996 | 29 | 2938 | 2909 | 2880 | 2851 | 28.2822 | 9．9319 | 9401 | 948 | 956 | 9648 | 973 | 98 | 989 | 9978 | ．060 | 30 |
| 31 | 2519 | 2489 |  |  | 2399 | 236 |  |  | 2279 | 29.2249 | 10.2630 | 2715 |  |  |  | 3055 |  |  |  |  |  |
| 32 | 195 |  |  |  |  |  |  |  |  | 30．16 | 10 | 603 | 6 | 620 |  | 63 | 6467 |  |  |  | 32 |
| 33 | 139 | 1359 | 1327 | 1295 | 1263 | 1232 | 1200 | 1168 | 1136 | $31 \cdot 110$ | 10.92 | 93 | 943 | 9523 | 96 | 9704 | 979 |  |  |  |  |
| 34 | 082 |  |  | 0729 |  |  |  |  | 036 | ， | 11.25 | 26 | 27 | 28 |  | 302 | 312 | 32 |  |  | 34 |
| 35 | 0263 |  |  |  |  |  |  | ＋026 |  | 32.99 | 11.587 | 596 |  | 616 | 625 | 635 | 644 | 65 | 6640 | 673 | 35 |
| 36 | 969 | 96 | 9630 | 9595 | 9560 | 9525 | 949 | 945 | 942 | $33^{\circ} 9386$ | 11.91 | 92 | 9380 | 9479 | 9578 | 9677 | 9776 | 9874 | 9973 |  |  |
| 37 | 91 | 9100 | 906 | 9028 |  | 895 |  |  |  | 34．88 |  | 259 | 269 |  |  | 3001 |  | 32 |  |  | 37 |
| 38 | 857 | 85 | 849 | 8461 | 8425 | 838 | 83 |  |  |  | 12 |  | 60 |  |  | 6325 | 6430 | 6534 | 663 |  | 38 |
| 39 | 800 | 79 | 793 | 7894 | 7857 | 7819 | 77 | 774 | 706 |  |  | 922 | 93 | 943 |  | 9650 | 9757 |  |  |  | 39 |
| 40 | 7443 | 7405 | 7366 | 7328 | 7289 | 7250 | 12 | 7173 | 7134 | $37 \cdot 7095$ | $13 \cdot 2$ | 25 | 2645 | 2755 | 2864 | 2974 | 3084 | 3194 | 3303 | 3413 | 40 |
| 41 | 6879 | 6840 |  |  | 6721 | 6682 |  |  |  | 38.65 |  |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 6316 | 627 | 62 |  | 6154 | 6113 |  |  |  | 39.59 | 13.9 |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 57 | 57 | 56 | 5627 | 5586 | 5544 | 550 | 546 | 5419 | $40 \cdot 53$ | 14 |  | 259 |  |  | 29 | 306 | 31 | 33 |  | 43 |
| 44 | 518 | 5145 | 51 | 5060 | 5 | 4975 | 493 | 489 | 4848 | 41.48 | 14.5 | 578 |  | 6030 | 6 | 627 | 6392 | 65 | 63 | 675 | 44 |
| 45 | 462 |  | 45 | 4494 | 4450 | 4407 | 436 | 43 | 4276 | 42.4 | 14.8 |  |  |  | 94 |  | 97 |  | 9966 |  | 45 |
| 46 | $4 \times 60$ | 4016 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 3496 | 3451 |  | 3360 |  | 326 |  |  |  | 4430 | 15.5600 |  |  |  |  | 6245 | 637 |  |  |  | 47 |
| 48 | 293 | 2886 | 2840 | 2793 | 2747 | 2700 | 265 |  | 256 | 45 | 15 | 904 |  | 9306 |  | 956 | 9701 | 983 |  |  | 48 |
| 49 | 236 | 2321 | 2274 |  |  | 213 |  |  |  | 46 | 16 | 235 | 249 | 262 |  | 289 | 3028 |  | 3297 |  | 49 |
| 50 | 18 | 1756 | 1708 | 1660 | 1611 | 1563 | 1515 | 1466 | 1418 | 47 | 16.5532 | 5669 | 5806 | 5943 | 6081 | 6218 | 6355 | 6492 | 6629 | 676 | 50 |
| 51 | 1240 |  |  |  | 1044 | 099 | 094 |  | 0846 | $48^{\circ} 079$ |  |  |  |  |  | 954 | 9682 | 9822 |  |  |  |
| 52 | 067 | 06 | 057 | 052 |  | 042 |  |  |  | $49^{\circ} 02$ |  | 22 | 24 |  |  |  | 30 | 31 | 32 | 343 |  |
| 53 | 011 |  |  |  |  |  |  |  | 9703 | 49.96 | 17.5464 |  |  |  |  |  | 633 | 64 |  |  |  |
| 54 | 954 | 949 |  |  |  | 9288 |  |  | 9131 | $50 \cdot 90$ | 17.8 |  | 907 | 92 |  | 9515 | 9663 | 98 | 9960 | 10 | 54 |
| 55 | 898 | 893 |  |  |  |  |  |  |  | 51.8506 | 18. |  |  |  |  |  |  |  |  |  | 55 |
| 56 | 842 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 78 |  |  |  |  |  |  |  | 7416 | 53.73 |  |  | 901 |  |  |  | 9645 | 9801 |  |  |  |
| 58 | 729 | 72 | 7181 | 7125 | 7069 | 7013 | 695 | 6901 | 6845 | 54 | 19.2 | 217 | 233 | 24 |  | 2813 | 297 | 313 | 3290 |  |  |
| 59 | 67 |  |  |  | 650 |  |  |  |  |  | 19.5 | 548 | 565 |  |  |  | 6299 | 64 | 662 |  | 59 |
| 60 | 61 | 610 | 6049 | 5992 | 5934 | 587 |  |  | 5701 | 56.5643 | 19 | 8803 | 8967 | 9132 | 9297 |  |  | 979 | 995 | 12 | 60 |
| 61 | 5601 |  |  |  |  |  |  |  |  | $57 \cdot 50$ | 20•1949 |  |  |  |  |  |  |  |  |  | 61 |
| 62 | 503 | 497 | 49 | 4858 | 479 | 473 | 46 |  |  | 58.44 | $20 \cdot 5$ | 54 |  |  |  |  |  |  |  |  |  |
| 63 | 4473 |  |  |  | 4230 |  |  |  |  | －3925 | －8570 |  |  |  |  |  |  |  |  |  |  |
| 64 | 390 |  | 86 | 3724 |  |  |  | 3477 | 341 | $60 \cdot 33$ | $21 \cdot 1881$ | 205 | 2182 |  | 25 |  |  |  |  |  |  |
| 65 | 334 | 3283 | 3220 | 3157 |  | 3032 |  |  |  | 61.2780 | $21 \cdot 519$ | 5370 |  |  |  |  |  |  |  |  | 65 |
| 66 | 278 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 22 |  |  |  |  |  |  |  |  |  |  |  | 2180 |  |  |  |  |  |  |  |  |
| 68 | 165 | 15 | 152 | 145 | 139 | 132 | 12 | 1194 | 1128 | $64 \cdot 106$ | 22.51 | 53 | 54 |  | 58 | 6380 |  | 64 |  | 68 |  |
| 69 | 109 | 1 |  |  |  |  |  |  |  |  | 22.84 | 862 | 812 |  | ， | 仡 |  |  |  |  | 69 |
| 70 | 05 |  | 0391 | 032 | 025 | 0188 | 0121 | －053 |  | 65.99 | $2{ }^{2}$ | 193 | 12 | 2321 | 2513 | 270 |  |  | 328 | 347 | 70 |
| 71 | 99 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 939 | 93 | 9259 | 91 | 912 | 9051 |  |  | 8842 | 67－87 | 23.83 | 85 | 87 | 89 |  |  |  | 978 |  | 析 | 72 |
| 73 | 8 |  |  |  | 8553 |  |  |  | 8270 | 68．819 | －167 |  |  | 227 | 2478 | 2678 | 矿 |  |  |  |  |
|  | 8270 | 8199 | 28 | 805 | 7985 | 7913 | 42 | 7770 | 7698 | 69.76 | 24．49 | 519 | 539 | 559 | 579 | 6002 | 620 | 6408 | 661 | 681 | 7 |
| 75 | 77 | 7634 |  |  | 7417 | 7345 |  |  | 7127 | $70 \cdot 7054$ | 24.829 |  |  | 8915 | 912 |  |  | 9738 | 99 | 11 |  |
| 76 | 14 | 7069 |  |  | 6849 |  |  |  | 6555 |  |  | 1817 | 2025 |  | 寿 |  |  | 析 | 3276 |  | 76 |
| 77 |  |  |  | 578 | 6281 |  |  |  |  | 72.59 |  | 517 | 53 |  | 568 |  |  | 6398 |  |  |  |
| 78 | 6015 | 5940 | 5864 | 578 | 571 | 56 | 5563 | 5487 | 5412 | 73.533 | 25.822 | 8444 | 8658 | 8872 | 908 | 930 | 95 | 9728 | 9942 | 15 |  |
| 79 | 5451 | 375 | 迷 | 282 |  | 析 | 仡 | 析 | 40 | 476 | 154 | 175 | 1974 | 2190 | 407 | 262 |  | 375 | 27 | 仡 |  |
| 80 | 48 | 4810 | 4733 | 4655 | 4578 | 4501 | 22 | 346 | 4268 | 75.419 | $26 \cdot 485$ | 5070 | 529 | 5509 | 572 | 594 | 616 | 638 | 660 |  | 80 |
| 81 |  |  |  | 408 | 40 | 3932 | 3854 | 3775 | 369 | 76 | 26.816 | 838 | 8606 | 8828 | 905 | 927 | 9495 | 9717 | 939 |  |  |
| 82 | 37 |  | 3601 | 35 | 3443 | 3363 | 3284 | 3205 | 312 | $77 \cdot 304$ | $27^{\circ}$ | 169 | 192 | 21 | 237 | 259 | 2822 | 30 | 32 | 349 | 82 |
|  | 939 |  |  | 238 |  | 275 |  | 2634 | 19 | 78.24 | $27 \cdot 47$ | S03 | 523 | 546 | 569 | 5921 | － | 637 | 637 |  |  |
| 8 | 2631 | 2550 | 246 | 238 | 230 | 22 | 2145 | 2063 | 198 | $79 \cdot 1900$ | $27 \cdot 809$ | 83 | 8554 | 878 | 90 | 9246 | 94 | 970 | 9937 | 11 |  |
| 85 | 206 | 1985 | 1903 |  | 1739 | 1657 |  |  | 1410 | 80．1328 | 28.140 | 1637 | 1870 | 210 | 2337 | 2570 |  | 303 | 3270 |  |  |
| 86 | 1503 |  | 1338 |  | 1172 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 87 | 2939 | 0856 | 078 | 0688 | 0604 | 0520 | 043 |  | 026 | 82.018 | 28.802 | 8264 | 8503 | 8741 | 8980 | 9219 | 94 | 969 | 9935 | ， |  |
| 88 | 037 | 0291 | 020 | 0121 | －036 | 9951 | 9866 | 9781 | 969 | 82.961 | $29 \cdot 13$ | 157 | 1819 | 2060 | 2302 | 254 | 2785 | 3026 | 3267 | 35 | 88 |
| 89 | 寿 |  | 左 | 954 | 9468 | 9382 |  | 9210 | 125 | 83.9037 | 29.464 | 489 | 5135 | 5370 |  | 5 |  | 635 | 6600 | 有 |  |
| 9 | 92 | 9161 | 9074 | 8987 | 8900 | 8813 | 26 | 8639 | 55 | 84.8465 | $29 \cdot 7957$ | 8204 | 8451 | 869 | 894 | 919 | 94 | 968 | 993 | 17 |  |
| 91 | 8684 | 8596 | 850 | ${ }^{8420}$ | 8333 | 8245 | 8157 | 8068 | 7980 |  | 30．126 | 151 | 176 | 2017 | 226 | 2516 | 2766 | 3016 | 3265 | 351 |  |
| 92 | 8120 | 803 | 7942 |  | ， 65 | 7676 | 787 | 7498 | 7409 | 867320 | 30．4578 | 4831 | 5083 | 533 | 5588 | 584 |  | 34 | 599 | 685 |  |
| 93 | 7556 | 7466 | ， | 7287 | 7197 | 7107 | 7017 | 6927 | 683 | $87 \cdot 674$ | 30.788 | 8144 | 8399 | 865 | 8910 | 916 | 942 | 9675 | 9930 |  |  |
| 9 | 69 | 690 | 681 | 6720 | 29 | 6538 | 6448 | 6356 | 6265 | 88.617 | $31 \cdot 1200$ | 1458 | 171 | 197 | 223 | 248 | 274 | 3005 | 326 | 35 |  |
| 95 | 6428 | 6337 | 6245 |  |  |  |  |  |  | 89.56 | 31 451 | 4771 | 5032 |  |  | 5814 | 6074 | 633 |  |  |  |
| 96 | 864 | 5772 | 5679 |  |  | 5401 | 5308 | 215 | 5122 | $90 \cdot 50$ | $31 \cdot 7821$ | 808 | 8348 |  | 8875 |  |  | 665 | 析 |  |  |
|  | 538 | 520 | 5113 | 502 | 49 | 48 | 473 | 464 | 455 | 91.445 | $32 \cdot 113$ | 139 | 168 | 1930 | 219 | 24 | 2729 | 5 | 32 |  |  |
| 98 | 4736 | 4642 | 4547 |  | 58 | 4263 | 41 | 4074 | 9978 | 92388 | 32.4442 | 4711 | 4980 | 524 | 5518 | 5787 | 5056 | 6324 | 6593 | 686 |  |
|  |  | 4077 | 3982 |  |  |  |  |  | 340 | 93.331 | 32.7753 | 802 | 8296 | 856 | 88 | 91 |  | 9654 | 99 | －197 |  |
| 100 | 3609 | 3512 | 3416 | 3319 | 3223 | 3126 | 3029 | 2932 | 2836 | 94．2739 | $33 \cdot 1063$ | 1338 | 1612 | 1887 | 2161 | 2436 | 2710 | 2984 | 3258 | 353 | 10 |
|  | $40^{\prime}$ |  | $38^{\prime}$ | ｜ $37^{\prime}$ | $36^{\prime}$ | 35 | ｜ $34^{\prime}$ | ｜ $33^{\prime}$ |  | ｜31＇ |  |  |  |  | $36^{\prime}$ | ， | ｜ $34^{\prime}$ |  |  |  |  |
| 70 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $70^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

| $20^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | SIne． |  |  |  |  |  |  |  |  |  | $0^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $21^{\prime}$ | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 |  |  | 20 | $21^{\prime}$ | $22^{\prime}$ | $23^{\prime}$ | 24 | $25^{\prime}$ | $26^{\prime}$ | $27^{\prime}$ | 28 |  |  |
|  | 9377 | 9376 | 93 | 9374 | 93 | 9372 | 9371 | 9370 | 9369 | ． 9368 | 3475 | 3478 | 3480 | 3483 | 3486 | 3488 | 3491 | 3494 | 34 | 3499 |  |
|  | 8754 | 8752 | 875 |  | 8746 | 8744 | 874 |  | 873 | ． 873 | 6950 | 6955 | 6961 | 6966 | 69 | 69 |  | 6988 | 6993 |  |  |
|  | 131 | 8128 | 8125 | 812 | 8118 | 81 | 81 | 8108 | 81 |  | 24 | 0433 | 044 | 0449 | 045 | 046 | 047 | 0482 | 0490 | 0498 |  |
|  |  |  |  |  |  |  |  |  | 7475 |  | 1.3899 | 3910 | 3921 | 393 | 3943 | 395 | 3965 | 76 | 3986 |  |  |
|  | 884 | 6879 | 6874 |  |  | 6859 | 6854 | 6849 | 6844 | 4.6839 | 17374 | 73 | 740 | 7415 | 7429 | 7442 | 7456 | 7469 | 7483 |  |  |
| 6 | 626 | 62 | 62 | 6243 | 6237 | 6231 | 6225 | 6219 | 6213 | $5 \cdot 620$ | 20842 | 0865 | 088 | 0898 | 0914 | 0931 | 0947 | 0963 | 0980 | 099 |  |
|  | 56 | 56 | 562 | 56 |  |  | 559 |  | 558 |  |  |  | 4362 | 43 | 44 | 44 | 44 | 4457 | 4476 | 4495 |  |
|  | 5015 |  |  | 4991 | 49 | 4974 |  |  | 4950 | $7 \cdot 494$ |  |  | 7842 | 7864 | 7886 | 7908 | 7929 |  | ， |  |  |
|  | 4392 | 4383 | 437 | 436 | 4355 | 4346 | 4337 | 4328 |  |  | 表 |  | 1322 | 134 | 1371 | 13 | 14 | 1445 | 147 | 1494 |  |
| 10 |  |  | ， | 373 | 3728 | 18 | 08 |  |  | 9.36 | 3.4748 | 477 | 4803 | 4830 | 4857 | 488 | 491 | 4939 | 496 | 4993 | 0 |
| 11 | 3146 | 3134 |  |  |  | 3090 | 3079 |  | 3056 | 10 | ． 8223 | 8253 | 828 | 831 |  |  |  |  |  |  |  |
| 12 | 252 | 25 | 249 | 2486 | 2474 | 2462 | 2449 | 2437 | 2425 | 11.2 | 169 |  | 1763 | 179 |  |  |  |  |  |  |  |
| 13 | 1899 | 1886 | 18 |  |  | 1833 | 1820 | 180 | 1794 | $12 \cdot 17$ | 51 | 5208 | 5243 | 5279 | 53 | 53 | 53 | 5421 | 5456 | 549 | 3 |
| 14 | 127 | 126 |  |  |  | 1205 | 119 |  | 1163 |  | 86 |  | 8724 | 876 | 8800 | 8838 | 8876 | 8915 | 8953 |  |  |
| 15 | 0653 | 0638 | 06 | 060 | 0592 | 0577 | 05 | 0547 | 0531 | 14.05 | 5122 | 2163 | 2204 | 2245 | 2286 | 2327 | 2368 | 2408 | 2449 | 249 | 15 |
| 16 | 003 | －014 | 9998 | 9981 | 9965 | 9949 | 9933 | 9916 | 9900 | 14.9884 | 5.5597 | 5641 | 5684 | 5728 | 5772 | 5815 | 5859 | 5902 | 5946 | 5990 | 16 |
| 17 | 948 |  | 9372 |  |  | 9321 | 9303 |  |  | 15.925 | 907 |  |  | 921 | 92 | 9304 | 9350 |  |  |  | 17 |
| 18 | 878 | 8765 | 87 | 87 | 8711 | 8693 | 8674 | 8656 | 8638 | 16.8619 | 6.25 |  |  | 2694 |  |  |  |  |  |  |  |
| 19 | 8181 |  |  |  |  |  | 804 |  | 8006 |  | 6.60 |  | 25 | 6177 | 622 | 62 | 633 | 6384 | 64 | 6488 | 19 |
| 20 | 7537 |  |  |  |  |  |  |  |  | 18 | 6.9496 |  | 05 | 9660 | 971 | 976 | 9823 | 878 | 993 | 998 | 20 |
| 21 | 69 | 6893 |  | 6850 |  | 6808 | 6787 | 6765 | 6744 | $19 \cdot 6723$ | －2971 |  |  |  |  |  |  |  |  |  | 21 |
| 22 | 629 | 62 | 62 | 62 |  | 6180 | 61 | 6135 | 6113 | 20.6 | 6461 | 6506 | 656 | 6626 | 6686 | 6746 |  |  |  |  |  |
| 23 | 5068 |  | 562 |  |  | 5552 | 55 |  |  | 21.545 | 992 |  | ＋0．6 | 010 | 01 | 0234 | 278 | 0360 | 0422 | 048 | 23 |
| 24 | 5045 | 5021 | 49 | 49 |  | 4923 | 4899 |  | 4850 |  |  |  | 35 | 3592 |  | 3723 | 378 | 3854 |  |  | 24 |
| 25 | 4422 | 439 | 437 | 434 | 432 | 4295 | 4270 | 4244 | 4219 | 23.4194 | 68 |  | 700 | 707 | 71 | 7211 | 7279 | 7347 | 7416 | 748 | 25 |
| 26 | 3799 | 3772 | 3746 | 37 | 3693 | 3667 | 3641 | 3614 | 3588 | 24.356 | ． 034 | 0416 | 0487 | 0558 | 0629 | 0700 | 0770 | 0841 | 0912 | 098 | 26 |
| 27 | 175 |  |  |  |  |  | 3011 |  |  | 25.292 |  |  |  | 40 | 41 |  | 42 |  |  |  | 27 |
| 28 | 255 | 25 | 2496 | 2467 | 2439 | 2411 | 2382 | 235 | 2325 | 26.229 | 97295 |  |  | 7524 |  |  |  |  |  |  |  |
| 29 | 19 | 190 |  |  | 1812 | 1782 | 175 |  |  | $27 \cdot 166$ | 10 | 0849 | 0928 | 100 | 1086 |  | 1244 | 1323 | 1402 | 48 | 29 |
| 30 | 1306 | 127 | 124 |  |  | 1154 | 1124 |  | 1063 | 28－1032 | 10 | 4326 | 4408 | 4490 | 457 | 46 | 473 | 481 | 48 | 498 | 30 |
| 31 | 883 | 0652 |  |  |  |  | 0494 |  |  |  | 10．7719 |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 006 | ＋027 | 99 | 9963 |  |  |  |  | 9800 | 29.9768 | 11.1 |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 9437 | 9403 | 937 |  |  | 9270 | 9236 |  |  | 30.9135 | 11.4669 |  | 489 | 4939 | 5029 |  |  | 5299 | 5389 | 547 | 33 |
| 34 | 881 |  |  |  |  | 8641 | 8607 |  | 8538 | 31 |  |  | 83 | 842 | 85 |  | 87 | 879 | 8885 |  | 34 |
| 35 | 8190 | 8155 | 81 |  | 8049 | 8013 | 7978 | 7942 | 7907 | 32.787 | 12 | 171 | 180 | 190 | 2000 | 20 | 219 | 228 | 238 | 247 | 35 |
| 36 | 7567 | 7531 | 7494 | 7458 | 7422 | 7385 | 7348 | 7312 | 7275 | 33 | 12 | 51 | 5290 | 5388 | 5486 | 5584 | 5682 | 5780 | 5878 | 5977 | 36 |
| 37 |  |  |  |  |  |  |  | 6682 | 664 | 34.6606 | 12.8568 |  |  |  |  |  |  |  |  |  |  |
| 38 | 632 | 62 |  |  |  | 6129 |  | 605 | 6013 | $35 \cdot 5$ | 13.2 | 214 |  | 23 |  |  |  | 2768 | 28 |  | 38 |
| 39 | 5698 | 565 |  |  |  |  | 546 |  |  | $36 \cdot 5$ | 13 | 5624 |  | 583 |  |  | 61 | 2762 |  |  | 39 |
| 40 | 5075 | 5034 | 499 | 4953 | 4913 | 4872 | 4832 | 479 | 4750 | $37 \cdot 4710$ | 13.8992 | 9102 | 9211 | 9320 | 9429 | 9538 | 9647 | 9756 | 9865 | 997 | 40 |
| 41 | 445 |  |  | 432 |  |  | 4202 |  |  | 38．4077 |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 382 | 378 | 374 | 37 |  |  |  |  | 3488 |  | 14 |  |  |  |  |  |  |  |  | 697 | 42 |
| 43 | 32 | 3162 | 31 |  |  |  | 2944 |  | 28 | 40.28 | 14.9 |  |  |  |  | ＋0， |  | 0238 |  | 047 | 43 |
| 44 | 2582 | 25 |  | 24 | 2 | 2359 |  |  | 2225 | $41 \cdot 218$ |  |  | 313 | 325 |  |  |  | 373 | 385 | 3971 | 44 |
| 45 | 1959 | 1914 | 186 | 182 | 177 | 173 | 168 | 1640 | 1594 | $42 \cdot 154$ | 15.6 |  | 66 | 673 | 68 | 69 | 71 | 7225 | 73 | 747 | 45 |
| 46 | 1336 | 128 |  |  |  |  |  | 1010 |  | 4 | 15．9841 |  |  | 0218 |  |  |  | 0719 | 0845 |  | 46 |
| 47 | 0713 |  |  |  |  | 0475 |  |  | 0332 | 44.0284 | 16.3316 |  |  | 37 |  |  |  | 4213 | 434 |  | 47 |
| 48 | 009 | ＋0 | 99 | 9944 | 9895 | 9847 | 979 | 974 | 9700 | 44.9 | 16.6 |  | 7053 | 718 |  |  |  | 7707 | 783 | 968 | 48 |
| 49 | 94 | 94 |  |  |  |  |  |  |  | 45.9019 | $17 \cdot 0$ |  | 053 | 06 |  |  |  | 12 | 1335 | 146 | 49 |
| 50 | 884 | 8793 | 8742 | 8692 | 8641 | 8590 | 8540 | 8489 | 8438 | $46 \cdot 8387$ | 17.3741 | 3877 | 4013 | 4150 | 4286 | 4422 | 4559 | 469 | 483 | 496 | 50 |
| 51 | 822 | 8169 | 811 | 8065 | 8014 | 7962 | 7910 |  |  |  | 17.7215 |  |  | 63 |  |  |  |  | 328 |  |  |
| 52 | 7597 | 75 |  |  | 7387 |  |  |  |  |  | 18.0 |  |  | 11 |  |  |  |  | 182 |  | 52 |
| 53 | 697 | 69 |  | 6813 |  |  | 6652 | 6598 |  | 49.649 | 18.41 | 43 | 445 | 45 |  | 48 |  | 5177 |  |  | 53 |
| 54 | 635 | 629 | 624 |  | 6132 | 6078 | 6023 | 59 | 59 |  | 18 | 77 | 7934 | 80 | 822 | 837 | 852 | 867 | 881 | 896 | 54 |
| 55 | 57 | 56 |  |  |  |  |  |  |  | 51.5226 | 19. | 12 | 14 |  |  | －37 | 203 | 16 | 2314 |  | 55 |
| 56 | 5105 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 53．39 | 19•8064 |  |  | 8531 |  |  |  |  |  |  |  |
| 58 | 385 | 38 | 3741 | 3682 | 3624 | 3565 | 350 | 3447 | 33 |  | $20 \cdot 15$ |  | 18 | 20 | 21 |  |  |  | 280 | 29 | 58 |
| 59 | 32 |  |  |  |  |  |  |  |  |  | 50 |  | 533 | 549 |  |  |  |  | 630 |  |  |
| 60 | 2612 | 255 | 249 | 2430 | 2369 | 2308 | 2247 | 2186 | 2125 | 56.2064 | 20.8489 | 8652 | 881 | 898 | 914 | 9307 | 9470 | 934 | 979 | 9961 | 60 |
| 61 | 198 |  |  |  |  |  |  |  |  |  | $21 \cdot 1964$ |  | 2296 |  |  |  |  |  |  |  | 61 |
| 62 | 136 | 13 |  |  |  |  |  |  |  |  | 21.5 |  |  |  |  |  |  |  |  |  | 62 |
|  |  |  |  |  |  |  |  |  |  |  | －89 |  |  |  |  |  |  |  |  |  | 63 |
| 64 | 012 | ＋05 | 9990 |  |  |  | 973 | 9666 |  | 59.95 | 22.23 | 25 | 27 | 29 | 30 |  |  |  | 378 |  | 64 |
| 65 | 949 | 943 |  |  |  |  | 910 |  |  | －890 | 22.586 |  | 13 | 639 |  | 674 | 6926 |  | 砣 |  | 65 |
| 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 336 |  |  |  |  |  |  |  |
| 68 | 762 | 75 | 7490 | 7421 | 7352 | 72 | 72 | 7145 | 7076 |  | 23.628 | 647 | 66 | 68 |  | 721 |  | 758 |  |  | 68 |
| 69 |  |  |  |  |  |  |  |  |  | 64.63 |  |  | ， | 0327 |  |  |  |  |  |  | 69 |
| 70 | 638 | 6310 | 6239 |  |  | 6026 | 59 | 5884 | 5813 | ． 57 | $24 \cdot 3$ | 342 | 36 | 381 | 40 | 419 | 4382 | 4573 | 476 | 495 | 70 |
| 71 |  | 568 |  |  |  |  | 532 | 52 |  |  |  | 6905 |  |  |  |  |  |  |  |  | 71 |
| 72 | 513 | 506 | 49 | 49 | 48 | 477 | 469 | 46 | 455 | 67.447 | 25.01 |  |  |  |  |  |  |  |  |  | 72 |
|  | ， |  |  |  |  |  | 4068 |  | 仡 |  | 366 | 矿 | 485 |  |  |  | 4836 |  |  |  |  |
| 74 | 3888 | 3813 | 373 | 3664 | 3589 | 3514 | 3438 | 3363 | 328 | $69 \cdot 32$ | $25 \cdot 71$ | 733 | 754 | 77 | 79 | 81 | 83 | 854 | 87 | 89 | 74 |
| 75 | 32 | 31 | 3113 | 3037 | 2962 | 28 | 280 | 2733 | 2657 | 70.25 | 26.06 | 0816 | 102 | 122 | 1429 | 1634 | 183 | 2042 | 22 | 24 | 75 |
|  |  |  |  |  |  |  |  |  |  |  |  | 4293 |  |  |  |  |  |  |  |  | 76 |
| 78 |  |  |  |  |  |  |  |  |  |  |  |  | 楮 |  |  |  | 8820 |  |  |  | 77 |
| 78 | 139 | 131 | 1238 | 1159 | 1080 | 100 | 0922 | 0842 | 0763 | 73.06 | $27 \cdot 1035$ | 1248 | 146 | 16 | 188 |  | 231 | 252 | 273 | 29 | 78 |
| 79 | 015 |  |  |  |  | 0373 |  | 22 | 2132 |  | 4510 | 疗 | 494 | 5157 | 537 | 5 | 析 | 砛 | 623 |  | 79 |
| 80 | 0150 | 1069 | 88 | 07 | 26 | 9744 | 9663 | 9582 | 9501 | 74.941 | 27.798 | 820 | 842 | 864 | 885 | 9076 | 929 | 951 | 973 | 99. | 80 |
| 81 | 9526 | 9444 | 9363 | 9280 | 9198 | 9116 | 9034 | 8952 | 369 | 75.87 | 28.1460 | 168 | 190 | 21 | 23 | 25 |  |  | 322 |  |  |
| 82 | 8903 |  |  | 8 | 8571 |  |  | 821 | 8238 | $76 \cdot 81$ |  | 5158 | 5382 |  |  | 605 | 627 | 650 |  |  | 82 |
|  | 828 |  |  |  |  |  |  |  |  | $77 \cdot 75$ | 28.84 | 8636 | 8862 | 5 | 931 | 95 | 97 | 9994 | ＋22 |  | 83 |
| 84 | 765 | 7572 | 7487 | 7402 | 7317 | 7232 | 7146 | 7061 | 6976 | 78.68 | 29.18 | 21 | 2342 | 257 | 280 | 3030 | 325 | 348 | 371 |  | 84 |
| 85 | 7034 |  |  |  |  |  |  |  |  |  | 29 | 559 |  |  |  |  |  | 6981 | 砛 |  | 85 |
| 86 |  |  |  |  |  |  |  |  |  |  |  | 068 |  |  |  |  |  |  |  |  |  |
| 87 | 578 | 570 | 5612 | 55 | 5435 | 5347 | 525 | 5170 | 5082 | 81.493 | $30 \cdot 23$ | 25 | 27 | 302 | 32 |  | 373 | 39 | 420 | 44 | 87 |
| 88 | 516 | 5076 | 4986 | 4897 | 4808 | 4719 | 4630 | 4540 | 4451 | 82.436 |  | 602 | 6263 | 650 | 67 | 6983 |  | 2963 |  |  | 88 |
| 89 | 4541 | 201 | 析 | 4 27 | 418 | 409 | 4000 | 3910 | 3819 | $83 \cdot 3729$ | $30 \cdot 9258$ | 950 | 9744 | 998 | ＋229 | 0472 | 0714 | 095 | 120 | 4 | 89 |
| 90 | 3918 | 3827 | 3736 | 364 | 355 | 346 | 3371 | 3280 | 188 | 84－3097 | 31．2733 | 297 | 3224 | 34 | 3715 | 396 | 420 | 445 | 469 | 49 | 90 |
| 91 | 329 | 3203 | 3111 |  |  |  | 2742 | 2649 | 57 | 85 | 31．62 | 6456 | 6704 | 69 |  |  |  | 794 | 819 |  | 91 |
| 2 |  |  | 2486 |  | 227 | 2206 | 2113 | 2019 | 1926 | $86 \cdot 18$ | 31.968 | 993 | 18 | 043 | 068 | 0937 | 118 | 1439 | 168 |  | 92 |
| 93 | 204 | 195 | 186 |  | 1672 | 1578 | 1483 | 1389 | 1294 | 87 | 32.31 | 34 | 365 | 39 | 41 | 442 | 467 | 493 | 518 | 54 | 93 |
| 94 | 1426 | 1331 | 1236 | 1140 | 1045 | 0950 | 0854 | 0759 | ． 63 | 0568 | 32.6632 | 688 | 7145 | 740 | 65 | 791 | 8170 | 42 | 368 |  | 94 |
| 95 | 08 |  |  |  |  |  | 0225 | 0129 | 032 | 88.9935 | 33.0107 | 036 | 0625 | 088 | 1143 | 1402 | 16 | 192 | 217 | 24 | 95 |
| 96 | 0179 |  |  |  |  |  | 9596 | 9498 | 01 | 89.930 | 33＇358 | 844 | 410 | 43 | 462 | 4891 | 5153 | 5414 | 567 |  | 96 |
|  | 9556 |  | 9360 | 2 | 9164 | 90 | 8967 | 886 | 8770 | 867 | $33 \cdot 70$ | 7321 | 758 | 13310 | 81 | 83 | 864 | 390 | 917 | 943 | 97 |
|  | 8933 |  |  |  |  | 843 | 8337 | 8238 | 8138 | $91 \cdot 803$ | 34．05 | 0799 | 106 | 13 | 161 | 1868 | 213 | 240 | 26 | 293 | 98 |
|  |  |  |  |  |  | 78 | 7708 | 7608 | 7507 | 92．7406 | 34－4006 | 4276 | 4546 | 48 | 5086 | 5356 | 5626 | 589 | 616 | 6436 | 99 |
| 100 | 7687 | 7586 | 748 | 738 | 728 | 7181 | 7079 | 6977 | 6876 | 93.677 | $34 \cdot 748$ | 7754 | 802 | 329 | 8572 | 8845 | 9117 | 仡 | 966 | 9935 |  |
|  | $40^{\prime}$ | 139＇ | ［ $38{ }^{\prime \prime}$ | T 37＇ | $136^{\prime}$ | 35 | ｜ $34^{\prime}$ | ｜ 33 | $32^{\prime}$ | $31^{\prime}$ |  | $39^{\prime}$ |  | $37^{\prime}$ | $36^{\prime}$ | $35^{\prime}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.

| $20^{\circ}$ |  |  |  |  | Cosine. |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 335 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 8066 | ${ }_{8063}^{8709}$ | 8707 <br> 8060 |  |  | ${ }_{8}^{8701}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 7414 |  | ${ }^{7} 805$ | 7401 |  |  |  |  | 4128 | 39 |  |  |  |  |  |  |  |  |
|  | 5 |  | 6127 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 硅 | 5488 | 5481 | ${ }_{5474}$ | 5467 | 4459 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 4844 | 4836 | 4827 | 4819 | 4811 | 4803 | 4794 |  |  |  | 8256 | ${ }^{278}$ | 8300 | 8322 | ${ }_{8343}$ | ${ }_{8365}$ | ${ }_{87}$ |  |  |  |
| $10$ |  |  | 43544 | 4181 |  | 4162 |  |  |  |  |  | 1788 | 1813 | ${ }_{\text {lick }}^{1837}$ |  |  | ${ }_{5456}^{1911}$ |  |  |  |  |
|  | 27 | 22, | 2899 | 2888 | 2876 | 2885 | ${ }^{2854}$ | ${ }^{2842}{ }^{2}$ |  |  | ${ }^{3} 8.88222$ | ${ }^{8852}$ | ${ }^{8882}$ | 2012 | 82 |  | 202 | ${ }^{9032}$ |  |  |  |
| $\left\|\begin{array}{l} 12 \\ 13 \end{array}\right\|$ |  | ${ }^{226}$ | 225 | 2241 | ${ }^{2229}$ |  |  |  |  |  |  |  | ${ }^{2417}$ | 2450 |  |  |  |  |  |  |  |
| $\left[\left.\begin{array}{l} 13 \\ 14 \\ 15 \end{array} \right\rvert\,\right.$ |  |  | 1 | 0948 |  |  |  |  |  |  |  | 9448 | 548 | 研 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | $9$ | 96 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\left\|\begin{array}{c} 17 \\ 18 \end{array}\right\|$ |  |  | 838 | 836 | 83 | 832 | ${ }_{830}^{893}$ | ${ }_{8287}^{8988}$ |  |  |  | 30476 | 362 | ${ }^{2637}$ |  |  |  | 0322 |  |  |  |
|  |  | 73 | 208 | 70s |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 648 | ${ }^{6465}$ | 664 | 64 | 6400 | 6378 | 635 | 6335 |  |  |  |  | 4230 |  | 4344 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 41482 | ${ }_{4} 5151$ |  | 4408 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 3861 |  | 483 |  |  |  |  |  |  | ${ }_{3301}$ | 4334 |  |  |  |  |  |  |  |  |
|  |  | 324 | 3215 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\left\|\begin{array}{l} 27 \\ 28 \end{array}\right\|$ |  |  | 25 |  | 2514 |  |  |  |  |  |  |  | ${ }^{5438}$ | 5512 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 1189 |  | 1780 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 |  | ${ }^{1020}$ | 9888 | 9356 | ${ }^{92924}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3812 | 308 | 805 | 80 | 79 | 794 |  |  | 7841 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{679}$ | 676 | ${ }^{6723}$ | ${ }^{6886}$ | 6000 |  | ${ }_{5}^{659}$ | ${ }^{5836}$ |  |  |  | 86 | 589 | ${ }^{467}$ | 17545 |  | $\begin{gathered} 741 \\ 289 \end{gathered}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4734 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 357 |  |  | 3448 | 3405 | ${ }^{363} 3$ |  | 327 |  |  |  | 4925 | 5036 | 5148 |  |  | 5482 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{4}$ |  |  | 155 | 1505 | 145 | 141 | ${ }_{1369}^{2019}$ | 133 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 098 | 09 | 090 |  | 10811 | 0764 |  | 0672 |  |  | 894 | 90 | 9186 |  | 9431 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 963 | 9610 | 9562 | 958 |  | 9474 |  |  |  |  |  |  |  |  |  | $\left.\begin{aligned} & 721 \\ & 321 \end{aligned} \right\rvert\,$ |  |  |  |
|  |  |  |  |  | 82 |  |  |  |  |  |  | 306 | 320 | ${ }^{333}$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\left[\left.\begin{array}{l} 53 \\ 54 \end{array} \right\rvert\,\right.$ |  |  |  |  | 5676 | 5622 | 5567 | 5512 |  |  |  |  |  |  |  | 7 |  | ${ }^{8063}$ |  |  |  |
|  | ${ }^{5} 546$ | 455 | 4494 | 44 | 14381 | 4324 | 4268 | 4211 | 415 |  | 19.41 |  |  |  |  |  | 5010 |  |  |  |  |
|  |  |  | 3849 | 3791 | 37 |  |  |  |  |  |  |  |  |  |  |  | ${ }^{8555}$ | 28 |  |  |  |
| $\left[\begin{array}{l} 58 \\ 58 \end{array}\right]$ | ${ }^{5} 8$ |  | 2558 | ${ }_{2498}$ | ${ }^{2038}$ | 2378 | 2319 | 2259 | 2198 | 54.2 |  | ${ }_{4858}^{138}$ | 5015 | 5173 | 5331 | 5489 | 47 | ${ }^{2} 5$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 9848 |  |  |  |  |  |  |  |  |  |  |  | 9829 |  | 1176 |  |  |
|  | 5488 |  | 8684 | 8618 | 855 | 8487 | 8421 |  |  |  |  |  | 622 | 639 |  | 46 |  |  |  |  |  |
|  |  |  |  |  |  |  | 7771 |  |  |  | $22 \cdot 9$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 7325 | 725 |  | 7121 | 7053 | 693 |  |  | 3114 |  |  | ${ }^{3653}$ |  | 12 | 41791 | 4371 |  |  |
| $\left\lvert\, \begin{aligned} & 68 \\ & 68 \end{aligned}\right.$ | ${ }_{68} 688824$ |  |  | 60 | 5962 | 5892 | ${ }_{5822}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 59595 |  | 5456 | 5385 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{8837}$ |  |  |  |  |
| $\begin{aligned} & 74 \\ & \hline 75 \\ & \hline \end{aligned}$ | ${ }_{75}^{4}$ | ${ }_{16}$ | ${ }_{1583}^{228}$ | ${ }_{150}^{215}$ | 1429 | 1351 | ${ }^{12924} 1$ |  |  |  | 2 | 490 |  |  |  |  |  |  |  |  |  |
| $\left\|\begin{array}{c} 76 \\ 77 \end{array}\right\|$ | ${ }_{76} 10$ | 101 | 0337 | ${ }^{0859}$ | 0781 | ${ }^{0703}$ | ${ }^{06275}$ |  |  |  |  | ${ }^{883464}$ | ${ }^{864}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 31 ${ }^{78}$ |  |  | 76 | ${ }^{75435}$ | ${ }^{78}$ | 73 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{83} 86589$ |  | 6419 |  | 6248 |  | $1020$ |  |  |  |  | 3158 | 3384 |  | 3836 |  | 4287 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $185$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | ${ }^{4305}$ | ${ }_{358}^{426}$ | 41478 | 403 |  |  |  | ${ }_{7286}^{3754}$ |  |  | ${ }_{7}^{4959}$ |  | ${ }_{8472}^{4924}$ |  |  |  |  |
|  | 88 |  | 319 | 3340 | 3010 | 299 | 28 | 27 | 264 |  |  | 0818 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2085 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{19} 124$ |  |  | 1160 | ${ }^{10067}$ | ${ }^{0973}$ | 0879 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ${ }_{9963}^{9063}$ | 98 | 9772 | ${ }_{9676}$ | 95 | 9484 | 938 |  |  | ${ }_{8479}^{446}$ | 2 | 3985 |  |  |  |  |  |  |  |
|  |  | 9414 |  | 9221 | 92 |  |  | 8833 | 873 |  | ${ }^{33} 17$ |  | 226 | 252 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 74 |  |  | 907 |  |  |  | 111 |  |  |  |  |  |
|  |  |  |  |  |  |  | 69 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 6836 | 6735 | 6634 | 6533 | 6432 | 6331 | 6230 | 612 |  |  | 613 | 6405 |  | 6939 |  | 1 | 7738 |  |  |  |
|  |  | ${ }_{5}^{6197}$ | 5098 |  |  |  |  |  |  | 3 3:4722 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 16 |  |  |  |  |  |  |  |  |  | $16^{\circ}$ |  |  |  | 12 | $1{ }^{1}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 20 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $20^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | $51^{\prime}$ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | 58 | $59^{\prime}$ | 50 | $51^{\prime}$ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | $56^{\prime}$ | 57 |  |  |  |
|  | 934 | 93 |  | 9343 | 9342 | 9341 | 9340 | 9339 | 933 | －933 | 357 | 3559 | 3562 | 3565 | 3567 | 3570 | 3573 | 3576 | 3578 |  |  |
|  | 869 | 869 |  | 8686 | 8684 | 86 |  | 8 | 86 | 867 | 113 | 7118 | 71 | 71 | 7135 | 7140 | 7146 |  |  |  |  |
|  | 8039 | 803 |  | 8029 | 8026 | 8023 |  |  |  |  | ． 06 | 0678 | 0686 | 0694 | 0702 | 071 | 0718 | 072 | 07 | 07 |  |
|  | 7385 | 738 | 7376 | 72 | 7368 | 736 | 73 | 7356 | 7352 |  | 42 | 4237 | 424 | 4259 | 4270 | 4280 | 4291 | 430 | 4313 | 432 |  |
|  | 673 | 6726 | 6721 | 6715 | 6710 | 6705 |  |  |  |  | $\bullet 77$ | 779 |  | 7823 | 7837 | 7850 | 786 | 7878 |  |  |  |
|  | 6077 | 60 |  |  |  |  |  | 6034 |  | $5 \cdot 602$ | $2 \cdot 1339$ | 1355 | 1372 | 1388 | 1404 | 1421 | 1437 | 1453 | 469 | 148 |  |
|  | 5423 |  |  |  |  |  |  | 5372 |  |  |  | 491 | 493 |  | 49 | 49 | 5010 | 50 | 5048 | 506 |  |
|  | 4770 | 476 | 47 | 47 | 4736 | 47 | 47 | 47 | 47 | $7 \cdot 46$ |  | 474 | 8496 |  | 85 | 85 | 3583 | 8604 | 8626 |  |  |
|  | 411 |  |  |  |  |  |  |  |  |  |  | 2033 | 205 | 208 | 2106 | 213 | 215 | 2180 |  | 2229 |  |
| 10 | 3462 |  |  |  |  | 3410 | 3400 | 3389 | 3379 | 9.3368 | 565 | 5592 | 5619 | 564 | 5674 | 5701 | 572 | 575 | 578 | 5810 | 10 |
| 11 | 28 | 2797 | 2785 | 2774 |  | 275 | 2740 | 2728 | 2717 | 10.270 | ．9122 | 915 | 918 |  | 9241 | 9271 |  |  |  |  | I |
| 12 | 21 | 2142 | 21 | 2117 | 2105 | 209 |  |  |  | 11204 |  |  | 2743 | 2776 |  | 2841 | 2874 | 296 |  |  | 12 |
|  | 1500 |  |  |  |  | 1433 | 1420 | 140 | 1393 | $12 \cdot 13$ | 623 | 6270 | 630 | 6341 | 6376 | 6411 | 6447 | 648 |  | 6553 | 3 |
| 14 | 0847 | 0832 | 0818 | 0803 | 0789 | ， | 076 |  | 0730 | 13.07 |  | 9829 | 986 | 9905 | 9943 | 9981 | －019 | 0057 |  | 013 | 4 |
| 15 | 01 | 0177 | 0162 |  |  |  |  |  |  |  |  |  |  | 3470 |  | 3551 | 3592 |  |  |  | 5 |
| 16 | 953 |  |  |  |  |  |  |  |  | 14.939 | $5 \cdot 6904$ | 6948 | 6991 | 7035 | 7078 | 7122 | 7165 | 208 | 25 |  | 16 |
|  | 888 |  |  |  |  |  |  |  |  |  | ． 046 | 050 | 05 | 05 | 0645 | 0692 | 0738 | 0784 | 0830 |  | 17 |
| 18 | 823 | 8213 | 819 |  | 8157 | 8138 | 811 |  |  | 16.806 | 40 |  | 411 | 41 |  | 4262 | 43 | 43 |  |  | 18 |
|  | 7578 |  |  |  |  | 7479 |  |  |  |  | 757 |  | 767 | 7729 | 7780 |  | 788 | 935 |  |  | 19 |
| 20 | 6924 | 690 | 6882 | 6862 | 6841 | 20 | 6799 | 67 | 675 | 18.673 | $7 \cdot 1130$ | 1185 | 123 | 1293 | 1348 | 1402 | 145 | 151 | 15 | 1619 | 20 |
| 21 | 627 | 6248 | 6226 | 6205 | 6183 | 6161 | 6139 | 6117 | 6096 | 19.607 | $7 \cdot 4687$ | 474 | 480 | 485 | 4915 | 4972 | 5029 | 5086 | 5143 | 5208 | 21 |
| 22 | 56 | 559 |  |  |  | 5502 |  |  | 5434 | 20.541 | 263 |  | 836 |  |  | 8542 |  |  |  |  | 2 |
|  | 496 | 493 |  |  | 48 | 484 | 4819 |  | 477 | 21.47 | ． 18 | 1862 | 192 |  | 205 | 211 | 217 | 22 |  |  | 23 |
| 24 | 430 | 428 | 425 | 4234 | 42 | 418 | 415 | 413 | 4109 | $22 \cdot 408$ |  | 5421 | 548 |  | 5617 | 5682 | 57 | 581 |  |  | 24 |
| 25 | 3655 | 3629 | 3603 |  |  | 3525 | 349 | 3473 |  | 23：342 | 8.8913 | 8981 | 9049 |  | 9185 | 252 | 9320 |  |  |  | 25 |
| 26 | 300 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 234 | 231 | 22 |  |  | 2 | 217 | 215 | 2123 |  |  |  | 617 |  |  |  | 646 |  |  |  | 27 |
| 28 | 16 | 1664 | 163 |  |  | 1548 | 1519 | 149 |  | 26.143 | 9.958 |  | 9734 | 98 |  |  |  | 01 |  |  | 28 |
| 29 | 1039 |  |  |  |  | 0889 | 0859 | 0829 |  |  | 10.31 |  | 329 | 33 | 34 | 35 | 361 |  |  |  |  |
| 30 | 0386 | 0355 | 0324 | 0292 | 0261 | 0230 | 0199 | 0168 | 013 | 28.0105 | 10.66 | 6777 | 685 | 694 | 702 | 710 | 18 | 7266 | 7347 | 7429 | 30 |
| 31 | 97 | 9700 | 9668 | 9636 | 9603 | 9571 | 9539 | 9507 | 9475 | 28.9442 | 11 | 03 | 042 | 0505 | 0589 | 0673 | 0757 | 084 | 0926 | 101 |  |
| 32 | 907 |  |  |  |  | 89 | 8879 | 884 | 881 | 29.87 | 11.38 |  | 398 |  |  | 4243 | 4330 | 4417 | 4504 |  | 32 |
| 33 | 842 | 8390 | 83 | 832 |  | 8 | 8219 | 8185 | 8150 | $30 \cdot 81$ | 1173 |  | 754 |  |  |  | 7903 |  |  |  | 33 |
| 34 | 77 | 773． | 77 |  |  | 759 | 755 | 752 | 7488 | 31.74 | 12.092 | 10 | 110 | 119 | 1291 | 1383 | 1476 | 1568 | 1660 | 175 | 34 |
| 35 | 7117 | 7080 | 7044 | 700 | 6972 | 6935 | 6899 | 6862 | 6826 | 32.6790 | 12.4478 | 573 | 4668 | 4763 | 4858 | 4953 |  |  | 5239 | 533 | 35 |
| 36 | 64 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 36 |
| 37 | 58 | 577 |  |  |  |  |  |  |  | 34.54 | 13．15 |  |  |  |  |  | 21 | 2280 |  |  | 37 |
| 38 | 51 | 5116 | 507 | 503 |  | 4958 | 4919 |  | 4840 | 35.48 | 13.51 |  |  | 5457 | 5560 | 5664 | 5767 | 5870 |  |  | 38 |
| 39 | 4501 | 446 | 442 | 4380 |  |  | 425 | 4218 | 4178 |  | 13.8704 | 881 |  |  | 9128 |  |  |  |  |  | 38 |
| 40 | 3848 | 3806 | 3765 | 3723 |  | 640 | 359 | 3557 | 3516 | 37．3474 | 14．3 |  | 247 | 2586 |  | 280 |  | 302 | 313 | 323 | 40 |
| 41 | 319 | 3151 | 310 | 3066 | 302 | 2981 | 293 |  | 285 | 38.281 | 14．5817 |  |  |  |  |  |  |  |  |  |  |
| 42 | 25 | 249 |  |  |  | 2322 |  |  |  |  | 14.93 |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 1886 | 1842 |  |  |  | 166 | 161 |  |  | 40.14 | 15.293 |  | 316 |  |  |  | 3631 | 3748 |  |  | 43 |
| 44 | 1232 |  | 114 |  |  | 1004 |  | 0913 | 0867 |  |  |  | 672 |  |  |  |  |  | 7443 | 7562 | 44 |
| 45 | 05 | 0532 | 0485 | 0439 | 0392 | 0345 | 0299 | 0252 | 0205 | 42. | $16^{\circ} 0043$ | 0165 |  | 0410 | 0532 |  | 0777 | 0899 | 1021 | 1143 | 45 |
| 46 | 9925 |  |  |  |  |  |  |  |  | 42.94 | 16．35 |  |  |  |  |  |  |  |  |  |  |
| 47 | 927 | 9222 | 917 |  |  | 9027 | 8978 |  |  | $43 \cdot 8832$ | 16.7 |  |  |  |  |  |  |  |  |  | 47 |
| 48 | 861 | 856 | 851 |  |  |  | 8318 |  |  | $44 \cdot 81$ | 17.0712 |  |  |  | 1234 |  |  |  |  |  | 48 |
| 49 | 796 | 7913 |  |  |  |  |  |  |  |  | 17－4269 |  | 4535 |  | 802 | 4935 |  |  |  |  | 49 |
| 50 | 7309 |  | 720 | 7154 |  |  | 6998 | 694 | 6894 | $46 \cdot 6842$ | $17 \cdot 7825$ | 79 | 809 | 8233 | 8369 | 850 |  | 8777 | 8912 | 904 | 50 |
| 51 | 665 |  | 655 |  |  |  | 633 | 62 | 623 |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 60 |  |  |  |  |  |  |  |  | 48.55 | 18.4938 | 508 | 52 |  |  |  |  |  |  |  | 52 |
| 53 | 53 | 5293 | 523 |  | 5128 | 507 | 501 |  | 4908 | 49 |  | 863 |  |  |  | 9215 |  |  |  |  | 53 |
| 54 | 469 | 4638 | 45 | 4526 |  | 44 |  |  | 42 |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 | 4040 | 3983 | 392 |  | 12 | 375 |  |  | 358 | 51 | 19.5608 |  | 59 |  | 6206 | 6355 | 6505 | 6654 | 6804 | 695 | 55 |
| 56 | 3387 | 3329 |  |  |  |  |  |  |  | 52.28 | 19.9164 |  |  |  |  |  |  |  |  |  | 56 |
|  | 273 | 267 | 261 |  |  | 243 |  |  |  | 53.22 | 20.2721 |  |  |  |  |  |  |  |  |  |  |
| 58 | 20 |  |  |  |  | 1778 |  |  |  | 5 | $20 \cdot 6$ |  |  |  |  |  |  |  |  |  |  |
|  | 1425 |  |  |  |  |  |  |  |  | 087 | －983 |  |  |  | 475 | 0636 |  |  |  |  |  |
| 60 | 0771 | 0709 | 0647 | 0585 | 0523 | 0460 | 039 | 033 | 0273 | 56.0211 | 21 | 355 | 37 | 3880 | 40 | 420 | 436 | 453 | 4695 | 485 | 60 |
| 61 | 0118 | ＋05 |  |  |  |  |  |  |  | 56.95 |  |  |  |  |  |  |  |  |  |  |  |
|  | 946 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 88 |  |  |  |  |  |  |  |  | 58.82 |  |  |  |  | 4745 |  |  |  |  |  |  |
| 64 | 815 |  | 802 |  |  |  |  |  |  |  |  |  |  |  |  | 848 |  |  |  |  |  |
| 65 | 75 | 743 |  |  |  |  |  |  |  | 689 | 23.1173 | 135 | 15 | 178 | 1880 | 20 |  | 2410 |  |  | 65 |
| 66 | 684 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 619 | 612 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 554 | 54 | 5400 | 5330 | 5259 | 518 | S | 504 | 4976 | $63 \cdot 49$ | $24 \cdot 18$ | 2027 | 22 |  | 25 | 2737 |  |  |  |  |  |
|  | 4887 |  |  |  |  |  |  |  |  | 64．424 |  | 5 |  |  | 148 | 淮 |  | 6712 |  |  |  |
| 70 | 4233 | 4161 | 4088 | 4016 | 3943 | 3870 | 379 | 3725 | 3652 | 65.357 | 24 －8956 | 914 | 933 | 952 | 971 | 990 | ＋09 | 0287 | 047 | 066 | 70 |
|  | 357 |  | 343 |  |  | 321 |  | 30 | 29 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2926 |  |  |  | 2627 | 255 | 24 | 240 | 23 | $67 \cdot 22$ |  |  |  |  |  | 7047 |  |  |  |  | 72 |
|  | 227 |  |  |  |  |  |  |  |  | 68.159 |  |  |  |  | 0419 | d |  |  |  |  |  |
| 5 | 161 | 1541 | 1465 | 1388 | 1311 | 1235 | 115 | 108 | 1004 | 69.092 | 26.318 | 33 | 35 | 378 | 3986 | 418 | 438 | 458 | 4790 |  |  |
| 75 | 09 |  |  |  |  |  |  |  | 0342 | 02 | $26^{\prime} 6738$ | 694 |  | 7350 | 755 | 775 | 7961 | 8165 | 836 | 8572 | 75 |
|  | 0310 |  |  |  |  |  |  |  |  |  |  | O50 | 028 | 0914 | 121 | 13 | 537 |  |  |  | 76 |
|  | 965 |  |  |  |  |  |  |  | － | 71－8937 | $27 \cdot 385$ |  | 27 |  | 4688 |  |  | 531 | 5525 |  |  |
| 78 | 9003 | 8922 | 8841 | 8760 | 8680 | 8599 | 851 | 843 | 8355 | 72•827 | $27 \cdot 7408$ | 762 | 783 | 804 | 8256 | 846 | 867 | 889 | 9103 | 93 |  |
|  | 8349 | 821 | 矿 |  |  |  | 7857 |  | \％ |  |  | 117 | － | 60 | 823 | 203 | 25 | 2461 | 2682 | 硅 |  |
| 80 | 7695 | 7612 | 7530 | 7447 | 364 | 7281 | 7197 | 7114 | 7031 |  | 28.452 | 473 |  | 517 | 539 | 568 | 582 |  |  | 647 | 80 |
|  | 704 | 6957 | 6874 | 6790 | 6706 | 6622 | 653 | 6453 | 6369 | 75.6285 |  | 829 |  | 838 | 8958 | 917 | 939 | 9618 |  |  | 81 |
|  | 6387 | 3 |  |  | 6048 | 5963 | 587 | 5792 | 570 | 76.562 | 29•163 | 185 | 20 | 23 | 2525 | 27 |  | 左 |  |  | 82 |
|  | 5734 | 5648 | 5562 |  |  | 538 |  | 5131 | 5045 | 77＊495 |  | 541 |  |  | 6093 | 631 | 554 |  |  |  |  |
| 84 | 5080 | 93 | 4906 | 4819 | 4732 | 464 | 455 | 4470 | 4383 | 78．4295 |  | 8975 | 920 | 9432 | 9660 | 988 | ＋11 | 03 | 0573 |  | 84 |
| 85 | 4426 |  |  |  |  |  |  |  | 3720 | 79.36 | $30^{2303}$ | 253 | 2765 | 2996 | 322 | 3458 | 36 | 3920 | 4151 | 438 | 85 |
| 86 | 3772 |  |  |  |  |  |  |  |  |  |  |  |  | 6561 |  |  |  |  |  |  |  |
| 87 | 311 | 30 | 2938 | 284 | 2758 | 2668 | 2577 | 2487 | 2396 | 81 | 30 |  |  | ， 26 |  | 5 | 083 | 107 | 仡 |  |  |
| 88 | 2465 |  |  |  | ， | 2009 | 1917 | 1826 | 1734 | 82.164 | $31 \cdot 2973$ | 3212 | 345 | 3690 | 3929 | 416 | 440 | 46 | 488 | 512 | 88 |
| 89 | 1811 |  | 227 | 534 | 42 | 1350 | 1257 | 1265 | 1072 | 9979 |  | 677 | 2413 | 25 | 7497 | 773 | 980 | 222 | 486 |  | 89 |
| 90 | 1157 | 1064 | 0971 | 0877 | 0784 | 0691 | 0597 | 0504 | 0410 | 84.0316 | $32 \cdot 008$ | 析 | 057 |  | 106 | 130 | 553 | 179 |  |  | 90 |
| 91 | 0503 | 04 |  |  |  | －032 | 9937 | 42 | 748 | 84．9653 | 32 | 385 |  | 4384 | 4632 | 487 | 51 | 53 | 5621 |  | 1 |
| 92 | 98 | 9 | 9659 | 89 | 810 | 9714 | 9277 | 9181 | 86 | 85.899 | $32 \cdot 7$ | 74 | 76 | 79 | 81 | 84 | 8699 | 8949 | 9199 | 944 | 析 |
| 94 | 915 | 9099 | 9003 | 89 | 881 | 8714 | 8617 | 8520 | 8424 | 86 | 33．0755 | 100 | 126 | 514 | 1766 | 2019 | 22 | 25 | 277 | \％ | 93 |
| 94 95 | 85 | 444 | 8347 |  | 2 | 8055 | 957 | 7859 | 776 | $87 \cdot 7664$ | 33．4312 | 456 | 4823 | 507 | 5334 | 558 | 58 | 610 | 6355 | 66 | 94 |
| 95 | 78 | 790 |  |  |  | 7396 | 7297 | 7198 | 7095 | ${ }^{1}$ | 33．7868 | 812 | 8385 | 86 | 830 | 915 | 9417 | 967 | 9934 | ＋192 | 95 |
| 97 | 723 | 7135 | 7035 | 36 | 6836 | 6737 | 6637 | 6537 | 㕍 |  |  |  |  | 2088 |  |  |  |  |  |  |  |
| 97 | 658 | 6480 | 638 | 6279 | 6178 | 6078 | 5977 | 5876 | 577 | 90．5674 | 34＊4981 | 5245 | 550 | 5772 | 6036 | 6298 | 656 | 6827 | 990 | 735 |  |
| 98 99 98 | 5927 |  |  | 5622 | 5520 | 5190 | 537 | 5255 | 113 | －5011 | 34•8538 | 880 | 90 | 93 | 9603 | 9870 | －13 | 040 | 066 | 093 | 98 |
|  | 5273 | 5170 | 5068 | 4965 | 62 | 4760 | 4657 | 4554 | 4451 | 92＊4348 | 35＇2094 |  | 2632 | 292 | 317 |  |  | 㖪 | 424 | 4515 |  |
| 100 | 4619 | 4515 | 4412 | 4308 | 4205 | （10） | 399 | 3893 | 3789 | 93．3685 | $35 \cdot 5651$ | 5923 | 6194 | 6466 | 6738 | 7010 | 7281 | 7553 | 7825 | 3096 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ |  |  |  | $10^{\prime}$ | $9^{1}$ | $8^{\text {r }}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $21^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $21^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | 1 | $2^{\prime}$ | $3^{\prime}$ | 41 | $5^{5}$ | $6^{\prime}$ | 7 | － |  |  |  |  |  | $4^{\prime} 1$ | $5^{\prime}$ |  |  |  |  |  |
|  | 9336 | 9335 | 9334 | 9333 | 9332 | 9331 | 9330 | 9328 | 9327 | 932 | 3584 | 3586 | 3589 | 3592 |  | 3597 | 3600 | 3603 | 3605 |  |  |
| 2 | 8672 | 8670 | 86 | 86 | 8663 | 8661 | 8659 | 86 |  |  | $\cdot 7167$ |  | 7178 | 7184 |  | 179 | 7200 | 7205 | 7211 |  |  |
|  |  | 8004 | 800 | 7998 |  | 7992 |  |  |  |  | 5 | 0759 | 0767 | 0775 | 0784 | 0792 | 0800 | 0808 | 0816 | 0824 |  |
| 4 | 73 |  |  |  |  | 7322 | 7318 | 7314 | 7310 |  |  | 4346 | 4356 | 4367 | 437 | 4389 | 4400 | 4411 | 4422 | 443 |  |
| 5 | 6679 | 6674 | 6669 | 6663 | 6658 | 6653 | 6648 | 42 | 6637 |  | 18 |  |  | 7959 |  |  | 3000 | 8013 |  |  |  |
| 6 | 6015 | 60 | 6002 | 5996 | 599 | 59 |  |  | 5965 | 5.5958 | ． 1502 | 1518 | 1535 | 1551 | 567 | 1584 | 1600 | 1616 | 632 |  |  |
|  |  |  | 53 |  |  |  |  |  |  |  |  | 518 | 5124 | 5143 | 5162 | 51 |  | 5219 | 5238 | 2 |  |
|  | 468 | 4678 | 4670 | 4661 | 4653 | 4645 | 4636 | 4628 | 462 | $7 \cdot 46$ |  | 86 | 8713 | 8735 |  | 871 | 00 | 砣 |  |  |  |
| 9 | 4022 | 401 | 4003 |  |  |  |  |  |  |  |  | 2278 | 23 | 2326 | 235 | 2375 | 2400 | 242 | 24 | 2473 |  |
| 10 | ， |  |  |  |  |  |  |  | 3274 |  |  | 5864 | 5891 | 5918 | 594 | 5973 | 6000 | 6027 | 6054 | 60 |  |
| 11 | 2694 | 2682 | 267 |  |  |  | 2625 |  | 2602 | 10.259 | 942 | 9450 | 9480 | 9510 | 9540 | S1 | 9600 | 930 | 959 | 688 |  |
| 12 | 2035 | 20 |  |  | 1980 | 196 | 195 |  | 192 |  |  | 3037 | 30 | 3102 | 31 | 31 | 3200 | 3232 | 3265 |  |  |
| 13 | 13 | 1352 | 1338 | 1325 |  |  |  |  |  |  |  | 6623 | 6658 | 6694 | 6729 | 6764 | 6800 | 6835 | 6870 | 6905 |  |
| 14 | 07 |  |  |  |  |  |  |  | 058 |  | 5 | 0210 | 0248 | 028 | 0324 | 0362 | 040 |  |  | 514 |  |
| 15 | 00 | 002 | －006 | 9990 | 9974 |  | 9943 | 9927 | 9912 | 13.9896 | ． 375 | 379 | 383 | 387 | 39 | 3959 | 4000 | 4040 | 4081 | 4122 |  |
| 16 | 9373 | 9356 | 9339 | 9323 | 9306 | 9289 | 927 | 9256 | 923 |  |  |  |  |  | 7513 |  | 7599 | 764 |  |  |  |
| 17 | 8709 |  |  |  |  |  |  |  |  |  |  |  |  | 1061 | 1107 | 1153 | 199 |  |  |  |  |
| 18 | 804 |  |  |  | 7969 |  |  |  |  |  |  | 4555 | 46 | 4653 |  |  |  |  |  |  |  |
| 19 | 73 | 7360 | 7341 | 7321 | 7301 | 728 |  | 7241 | 722 | $17 \cdot 72$ |  |  |  |  |  |  |  |  |  |  |  |
| 20 | 67 |  |  | 6653 | 33 |  |  | 70 |  | 18.652 | 7•167 |  |  |  |  | 194 | 199 | 205 | 10 | 162 |  |
| 21 | 60 | 603 |  |  |  |  |  |  |  | 19.585 |  | 5314 | 5371 | 542 | 548 | 5542 | 5599 | 5656 | 5713 | 5770 |  |
| 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 23 | 47 | 47 | 4676 | 4651 | 46 | 46 | 457 | 4555 | 453 | 21.450 | 242 |  |  |  | 2674 | 27 | 2799 |  |  | 2986 |  |
| 24 | 40 |  |  |  |  |  |  |  |  | 22．383 |  | 6073 |  |  | 6269 | 334 | 6399 |  | 6529 |  |  |
| 25 |  |  |  |  |  |  |  | 3212 | 3186 | $23 \cdot 3160$ | 8.9592 | 9660 | 9728 |  | 9864 | 9931 |  |  | 0135 | 0203 |  |
| 26 | 2731 |  |  |  | 2622 | 259 | 256 | 2541 | 2513 | 24.248 | 9.317 | 3246 | 3317 |  | 3458 | 3529 |  |  |  |  |  |
| 27 | 206 | 203 | 2010 | 1982 |  | 1926 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | 14 |  |  |  |  |  |  |  |  | 26．113 | 10 |  |  |  |  | 0723 | － | 087 |  | 102 |  |
| 29 | 073 | 0708 |  | 0648 | 0617 | 0587 | 055 | 0526 | 0496 | 27 |  | 4005 |  |  | 42 | 4320 | 4399 | 4478 | 4556 |  |  |
| 30 | 007 | 00 | －012 | 9980 | 9949 | 9917 | 988 | 9855 | 9823 | 27.9792 | 10.7510 | 759 | 767 | 7755 | 7836 | 7918 | 7999 | 8080 |  | 8243 |  |
| 31 | 9410 | 9378 | 9345 | 9313 | 9280 | 9248 | 9216 | 9183 | 9151 | $28^{\prime 9} 118$ | 11.109 |  |  |  |  |  |  |  |  |  |  |
| 32 |  |  |  |  |  |  |  |  | 8478 | $29 \cdot 8444$ | －4 |  | 4852 |  |  |  |  |  |  |  |  |
| 33 | 80 | 804 |  |  |  | 7909 |  |  | 780 | 30 | 11.82 | 8351 |  | 8530 |  | 8709 | 87 |  |  |  |  |
| 34 | 74 |  |  |  |  |  |  |  |  | 31－709 |  |  |  |  | 2214 |  |  | 24 | 25 | 2676 |  |
| 35 | 6753 | 671 |  |  |  |  |  |  |  |  |  |  |  |  |  | 5904 | 59 | 608 | 61 | 6284 |  |
| 36 | 60 |  |  |  |  |  |  |  |  |  |  |  | 9208 | 930 |  | 9501 | 9599 | 9697 | 9794 | 989 |  |
| 3 | 54 |  |  |  |  | 523 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 47 | 472 |  | 4642 |  |  |  | 4483 |  | 440 | 13 |  |  |  |  |  | 679 |  |  |  |  |
| 39 | 4096 | 4056 | 4015 | 析 |  |  |  | 3811 |  | 36.372 |  |  |  | －08 |  |  |  |  |  |  |  |
| 40 | 3432 | 339 | 3349 | 3307 | 3265 | 32 | 3181 | 3140 |  | 305 | 14 | 3456 | 3564 | 36 | 37 | 3890 | 3999 | 41 | 4216 | 4324 |  |
| 41 | 27 | 272 |  | 2640 |  |  |  |  |  |  | 14.693 |  |  | 726 |  | 7487 | 7599 |  |  |  |  |
| 42 | 210 | 206 | 2016 | 1972 |  |  |  |  |  |  | 15.05 |  |  |  |  |  |  |  |  |  |  |
| 43 | 144 |  | 1350 |  |  |  |  | 112 | 108 | 40：103 | 15.40 |  |  |  |  |  |  |  |  |  |  |
| 44 | 077 | 072 |  |  |  |  | 0500 | 0453 | 040 | 41.0361 |  |  |  |  |  |  | 8399 | 851 |  | 8757 |  |
| 45 | 011 | 006 | －017 |  |  | 9876 | 9829 | 9782 | 9735 | 41.9688 | 16．1266 | 1388 | 1510 |  |  | 1876 |  |  |  |  |  |
| 46 | 9447 | 939 | 9351 | 9303 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 47 | 878 | 873 | 8685 | 8636 |  |  | 8488 | 843 | 839 | 43 ＇8340 |  |  |  |  |  |  |  |  |  |  |  |
| 48 | 81 | 806 | 8018 |  |  |  |  |  |  | 44.7 | $17 \cdot 20$ |  | 2277 |  | 2538 | 2668 | 2798 | 292 | 3059 | 318 |  |
| 49 |  |  |  |  |  |  |  |  | 7045 | $45 \cdot 6993$ | 17 |  | 58 |  | 6132 | 62 |  |  |  |  |  |
| 50 | 6790 | 673 | 6686 | 6634 | 658 | 652 | 6477 | 6424 | 6372 | 46.632 | 17.9 | 9320 |  | 959 | 9727 |  |  |  |  | 40 |  |
| 51 | 612 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7057 | 7198 |  |  |  |  |
| 53 |  |  | 4687 |  | 4576 |  |  | 4410 |  | 49．429 | 18.99 | ＋07 | 022 |  |  | 06 | ， |  |  |  |  |
| 54 | 413 | 407 | 4021 |  |  |  |  | 37 |  |  |  |  |  |  |  | 425 |  |  |  |  |  |
| 55 | 346 | 341 | 33 |  |  |  |  |  |  | 29 | 19 | 7252 | 7401 | 7550 | 7700 | 7849 | 7998 |  | 8297 | 8446 |  |
| 56 | 28 |  |  |  |  |  |  |  |  | 52.2278 |  |  |  |  |  |  |  |  |  |  |  |
|  | 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 147 | 14 | 1356 | 1295 | 1234 | 1174 | 1113 | 105 | 098 | 54.09 |  |  |  |  |  |  |  |  |  |  |  |
| 59 | 081 |  |  |  |  |  |  |  |  |  |  | 1597 |  |  |  | 2238 | 2398 |  | 27 |  |  |
| 60 | 01 | 0086 | －023 | 9960 |  |  | 9772 | 9709 |  | 55.9583 | $21 \cdot 5021$ | 518 | 534 | 55 | 567 | 5835 | 599 | 6161 | 6324 | 6486 |  |
| 61 | 948 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 88 | 87 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 81 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 662 | 6798 |  |  |  |  |
| 64 |  |  |  |  |  |  |  | 7023 | 695 | 59.68 |  | 95 |  | 98 |  | 0224 |  |  |  |  |  |
| 65 | 682 | 675 |  | 6624 |  |  |  | 6352 |  | 0．6 |  | 3116 |  |  |  |  |  |  |  | 452 |  |
| 66 | 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 549 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 613 |  |  |  |  |  |
| 6 | 483 | 47 | 46 |  |  |  | 4408 | 433 | 42 | 63.4195 | 24 | 387 | 405 | 42 |  | 4613 | 4798 |  |  |  |  |
| 69 | 417 | 409 | 402 | 3954 |  |  |  | 366 |  | 64352 |  | 4818 | 析 |  |  | ， | 8398 | 858 | 23 |  |  |
| 70 | 35 | 3433 | 3360 | 3287 | 32 | 1 | 3067 | 299 | 292 | 65.284 | 25 | 104 | 23 |  |  |  | 199 |  |  | 256 |  |
| 71 | 284 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 21 |  |  |  |  |  |  |  | 157 | $67 \cdot 1500$ | $25 \cdot 80$ | 8220 | 841 |  |  |  |  |  |  | 星 |  |
| 73 | 151 | 1438 | 1361 | 1285 | 120 | 1132 | 105 | 098 | 0903 | ． | $26 \cdot 16$ | 180 | 200 | 2203 |  | 26 | 279 |  |  |  |  |
|  | O84 | 1472 |  |  |  |  |  |  |  |  |  | 593 | 518 |  | 5996 |  | 639 |  |  |  |  |
| 75 | 018 | 0107 | 29 | 998 | 987 | 9794 | 9715 | 9637 | 9558 | 69＊947 | 26.87 | 898 | 91 | 938 | 959 | 9794 | 999 |  | 0405 | 060 |  |
| 76 | 952 |  |  | 9283 | 920 | 9124 | 9045 | 896 |  |  |  | 2566 | 277 |  |  |  |  |  | 1 | 21 |  |
| 77 | 885 | 877 | 8696 | 8616 | 853 | 8455 | 8374 | 829 | 8213 | 咗 |  |  | 635 |  | 637 |  | 0788 |  | 7615 |  |  |
| 78 |  |  |  |  |  |  |  | 7622 |  |  |  | 9325 | 351 | －162 | 0374 | ， |  | 1009 | 1221 |  |  |
| 79 | 7529 | 46 | 7364 | 7281 | 719 | 7116 | 7033 | 695 | 686 | 73.678 | 28.3 | 3325 | 354 | 375 | 3969 | 418 | 439 | 46 | 4826 | 504 |  |
| 80 | 686 | 67 | 6697 | 6614 | 6530 | 6447 | 6363 | 6279 | 6195 | 611 |  | 691 | 7129 |  | 7563 | 778 | 7997 |  |  |  |  |
| 81 | 62 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5 |  |  | S27 | 5 | 5138 | 5022 |  | 4 | 764 | 29 | 4084 | 430 | 453 | 47 | 4975 | 5197 | 54 | 56 | 586 |  |
| 83 | 4872 | 478 | 4699 | 461 | 45 | 443 | 4351 | 426 | 4177 | 77•40 | 29.74 | 767 | 789 | 81 | 83 | 85 | 8797 | 902 |  | 947 |  |
| 84 | 4208 | 4120 | 32 | 3947 |  |  |  | 3593 | 矿 | 341 | 析 | 125 | 488 |  | 923 | 矿 | 239 |  |  |  |  |
| 85 | 3543 |  |  | 327 | 3188 | 3099 | 010 | 292 | 2832 | 79.2743 | 30．461 | 484 | 507 | 530 | 553 | 5767 | 599 | 6228 | 645 | 668 |  |
| 86 | 2879 |  |  | 261 | 252 | 2430 | 2340 | 225 | 2160 | 80 | 30＇81 | 843 | 8663 |  | 9130 |  | 9597 |  | ＋064 |  |  |
| 8 | 221 | 2124 |  | 1943 | 1852 | 1761 | 1670 | 1578 | 1487 | 81.13 |  | 216 | 225 | 248 | 23 | 2961 | 3197 | 3433 |  |  |  |
| 88 | 1551 |  | 1367 | 208 |  |  | 0999 | 023 | －1 | 82.07 | 1 1 | 51 | 5842 | 6 | 6320 | 6558 | 637 | －6 | 7275 | 751 |  |
| 89 | 0887 | ， |  | 0608 | 0515 | 0422 | 0329 | 023 | 01 | 83.004 | 31.89 | 918 | 943 | 96 | 9914 | ＋156 | 039 | 06 | 0880 | 11 |  |
| 90 | 0222 | 0128 | ＋035 | 9941 | 9847 | 9752 | 9658 | 9564 | 9470 | 83.9375 | 32.25 | 2776 | 3020 | 326 | 3509 | 3753 | 3997 | 4241 | 4486 | 473 |  |
|  | 9558 |  |  |  |  |  |  |  |  |  |  |  | 660 | 08 |  |  | 157 | 7844 |  |  |  |
| 92 | 4 | 8 | ， | 860 | 8510 | 84 | 8317 | 8221 | 814 | $85 \cdot 802$ | 32．96 | 9948 | －19 | 044 | 062 | 0947 | 119 | 14 | 1696 |  |  |
| 93 | 8230 |  |  |  | 784 | 7744 | 7647 | 75 | 74 | $86 \cdot 735$ | 33．3282 | 353 | 3787 | 4040 | 4292 | 454 | 4797 | 504 | 530 | 555 |  |
| 94 | 750 |  |  |  |  | 寿 | 6976 | 689 | 6779 | 66al | 33.686 | 712 | 737 |  | 188 | 814 | 8397 | 8652 |  |  |  |
| 95 | 6901 |  |  |  |  | 6405 |  |  | 6107 | －600 | 34.045 | 070 | 096 | 122 | 148 | 173 | 199 | 22 | 251 | 271 |  |
| 96 |  |  |  |  |  | 5736 |  | 5535 | 543 | 89.53 | $34 \cdot 40$ | 429 | 4555 | 4815 | 5076 | 53 | 559 | 5857 | 6118 | 637 |  |
|  | 557 | 5472 |  | 52 | 51 | 5066 | 4965 | 4863 | 4762 | 46 | 34.76 | 7880 | 8144 | 8407 | 8670 | 8934 | 9197 | 9460 | 9723 | 998 |  |
| 98 | 4909 | 4807 |  |  |  |  | 4294 | 4192 |  | 1 3.381 | 35.12 | 1467 | 1733 | 199 | 58 | 2531 | 2697 | 3063 | 3329 | 3595 |  |
|  |  |  |  |  | 383 |  |  | 352 | 34 | 92.331 | $35^{\prime} 47$ | 53 | 532 | 559 | 5859 | 6128 | 6397 | 66 | 6934 | 7203 |  |
| 100 | 3580 | 3476 | 3372 | 3267 | 3163 | 3058 | 2954 | 2849 | 2744 | 93．263 | $5 \cdot 836$ | 8640 | 8911 | 9183 | 9454 | 9725 | 9997 | 26 | 0540 | 0811 |  |
|  | $60^{\prime}$ | 59＇ | 58＇ | $57^{\prime}$ | $56^{\prime}$ | $55^{\prime}$ | $54^{\prime}$ |  |  | ｜ $51{ }^{\prime}$ |  |  |  | ${ }^{57}$ | 㐌 ${ }^{\prime}$ | ＋55＇ | $54^{\prime}$ | $53^{\prime}$ | $52^{\prime}$ | 51 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES

| $21^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $21^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ |  | $22^{\prime}$ | $23^{\prime}$ | ${ }^{\prime \prime}$ | T | 26 |  | 28 | 29 | 20 | $21^{\prime}$ | $2 \%$ | 23 | ${ }^{\prime}$ |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8630 | ${ }_{8627}$ | $8625$ |  | 8621 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7944 | 794 |  |  | 7932 | 28 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7259 | 725 |  |  | 7242 | 7238 | 234 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 657 | 6569 |  |  | 6553 |  | 65 | 6537 |  | 4.6526 |  |  | 8217 |  | 8244 | 8257 | 8271 | 8284 |  |  |  |
|  | 588 | 588 | 5876 | 5870 | 5863 | 5857 | 5851 | 5844 | 5838 | 5.583 | 2. | 1844 |  |  |  |  | 1925 | 1941 |  |  |  |
|  | 520 | 51 |  |  | 5174 | 5166 | 5159 | 5152 |  |  |  | 5484 | 5503 | 5522 |  | 5560 | 5579 | 588 | 5617 |  |  |
|  | 4518 |  |  |  | 4184 | 4476 | 4467 | 4459 | 4450 | ${ }^{4} 47$ | 2.9103 | 25 | 9147 | 9168 | 10 | 9212 | 9233 | 55 | 9277 |  |  |
|  |  |  |  |  |  |  | 3776 | 3766 | 37 |  | 3.2741 | 66 | 2790 | 28 | 2839 | 15 | 2888 | 2912 | 2936 |  |  |
| 10 | 31 |  |  |  |  |  |  |  | 3063 | 9．3052 | 3.6379 | 6406 | 6434 | 64 | 6488 | 6515 | 6542 | 6569 | 6596 |  |  |
| 11 |  |  |  |  |  |  |  |  | 236 | 10.23 | 4.00 | 04 | 0077 | 010 | 013 | 016 | 0196 | $0^{0226}$ | 0256 |  |  |
| 12 | 17 | 17 |  |  | 1727 | 1714 | 1701 | $1 \times 88$ | 16 | 1116 |  |  | 3720 |  |  | 3818 |  | 3883 | 3915 |  |  |
|  |  |  | 10 | 10 | 1037 | 1023 | 10 | 0996 | 0982 | 12.09 | 4.7293 | 7328 | 736 |  | 7434 |  |  |  | 7575 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 234 |  |  |
| 15 |  |  |  |  |  |  |  |  |  | 13.95 |  |  |  | 469 | 473 | 4772 | 481 | 4853 | 4894 |  |  |
| 16 | 903 |  |  |  |  |  |  |  |  |  |  |  | 8294 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 | 76 |  |  |  | 7590 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 19 | 6981 |  |  |  |  | 68 |  |  |  |  |  | 9172 | 9224 |  | 9327 | 9378 | 9429 |  |  |  |  |
| 20 | 629 | 627 |  | 623 | 6211 | ¢190 |  | 6147 | 6126 | 1 | 59 | 281 | 2867 |  |  |  |  |  |  |  |  |
| 21 | 5611 | 5589 | 5566 | 5544 | 5522 | 5499 | 5477 |  | 5432 | 19 | 7 | 645 | 651 | 65 | 662 | 668 |  |  | 6852 |  |  |
| 2 | 492 | 49 | 48 | 4856 | 32 | 4809 | 4786 |  |  |  |  |  | 015 |  |  | 0332 |  | 045 |  |  |  |
| 2 | 4 |  | 41 | 4167 | 4143 | 4118 | 4094 | 4070 | 4045 |  |  |  |  |  |  | 3984 |  | 4108 | 4171 |  |  |
|  |  |  |  |  | 3453 | 3428 | 3402 |  | 3351 |  |  |  | 74 |  |  |  |  |  | 783 |  |  |
| 25 | 28 | 28 | 28 |  | 2764 | 2737 | 2711 | 2684 | 2658 | 23 |  | 101 | 108 | 115 | 12 | 12 | 13 | 1422 | 1490 |  | 25 |
|  | 21 |  |  |  |  | 13 | 201 |  | 196 |  |  | 465 |  |  |  |  |  |  |  |  |  |
|  |  | 147 |  | 1414 |  | 13 | 13 | 12 | 127 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 08 |  |  |  |  |  |  |  | 057 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 012 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9626 |  |  |  |  |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 807 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 33 | 73 | 7353 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 | 67 |  |  |  |  |  |  |  |  |  | 12 |  |  |  |  | 41 | 4242 | 4334 |  |  | 34 |
| 35 | 60 | 59 | 5944 | 5907 | 5870 | 5832 | 5795 | 5758 | 5721 | 32.5683 | 12 | 742 | 75 | 7612 | 7707 | 7802 | 7896 | 7991 |  |  | 35 |
| 36 | 533 | 52 |  | 5218 |  | 5142 |  |  |  |  | 13 | 106 |  |  |  |  |  |  |  |  | 36 |
|  | 46 |  |  |  |  | 445 | 4412 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 13 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 3112 |  |  |  |  | 36 |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 25 |  |  |  |  |  | 2337 |  |  | 37 | 14 |  |  |  |  |  |  |  |  |  | 0 |
| 41 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 05 | 04 | 04 | 04 |  |  | 0263 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 | 91 |  |  |  |  |  |  |  |  | 41.87 | $16 \cdot 37$ |  |  |  |  | 4316 |  |  |  |  | 45 |
| 46 | 848 | 8432 | 838 | 833 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 71 |  |  |  |  |  |  |  |  |  | $17 \cdot 4$ | 47 |  |  |  |  |  |  |  |  |  |
| 49 | 64 |  |  |  |  |  | 6113 |  |  | 45.595 | 17.82 | 839 | 852 | 283 | 593 | 892 | 905 | 918 |  |  |  |
| 50 | 57 | 56 | 5634 | 5581 | 5528 | 5475 | 5422 | 5369 | 5315 | 46．526 | 18.1897 | 203 | 216 | 230 | 243 | 257 | 27. | 28 |  |  |  |
|  | 505 | 5001 | 49 | ${ }^{4893}$ | ${ }^{4838}$ | 4784 |  | ${ }^{46}$ |  | 47.45 | 18.55 | 563 |  |  |  | ${ }^{622}$ |  |  |  |  |  |
|  | 43 | 43 | 4259 |  | 4149 | 4094 | 4039 |  |  | － | 1 | 931 |  |  |  |  | －018 | 015 |  |  |  |
|  |  |  |  |  |  | 3403 | 3347 | 329 |  | 31 | 19.28 |  |  |  |  | 352 | 367 | 38 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | $12 \cdot 6$ |  |  |  |  |  |  |  |  |  |  |
| 5 | 23 | 225 | 2197 |  |  | 2022 |  |  |  | 51.17 |  |  |  |  |  |  |  | 1129 | 1278 |  |  |
|  |  |  |  |  |  | 13 | 12 | 121 |  | －10 | $20 \cdot 37$ |  |  |  |  |  |  |  |  |  |  |
|  | O23 |  | 08 |  |  |  | 05 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 025 | 01 |  |  | －012 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5277 | 5437 |  |  |  |  |  |
| 60 | 88 |  |  |  |  |  | 8506 | 8442 | 8378 | 55.83 | 21.8276 | 8438 | 86 | 8764 | 892 | 9089 | 9251 | 9413 |  |  |  |
|  | 82 | 7 | ${ }^{80}$ |  |  |  |  |  |  |  | 22.1 |  |  |  |  |  |  |  |  |  |  |
|  |  | 74 |  |  |  |  |  |  |  |  |  |  |  |  |  | 6392 | 655 |  |  |  |  |
|  | 68 | 6766 | 66 |  |  |  | 643 |  | ${ }^{629}$ | 58．625 | 23 |  |  |  |  |  | 021 |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 5602 | $59 \cdot 553$ | 23.2 |  | 31 |  | 7 |  |  | 404 | 42 |  |  |
| 65 | 546 | 53 | 5324 | 5255 | 186 | 5117 | 5048 | ， | 4910 | 60.484 | 23 | 664 | 681 |  | 717 | 7346 | 752 | 769 |  |  |  |
|  | 477 | 47 |  |  | 97 | ${ }^{4427}$ | 4357 |  |  | 61．414 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 37 | 3665 |  | 352 | 62 |  |  | 410 |  | 446 | 4649 | 483 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 848 |  |  |  |  |
| 69 | 27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 70 | 20 | 196 |  |  |  |  |  |  |  |  |  |  |  | 5224 | 5414 | 5603 |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 0823 |  |  | $25 \cdot 82$ |  |  |  |  |  |  |  |  |  |  |
|  |  | 05 | 05 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9988 | 9903 | 98 |  |  |  |  |  |  |  | 26.55 |  |  |  |  |  |  |  |  |  |  |
|  | 929 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 041 | 0610 |  |  |  |
| 75 | 861 | 853 | 77 | 7 | 8292 | 8212 | 8133 |  | 7973 | 69.78 | 27 |  | 研 |  | 兂 | 研 | 406 | 426 |  |  | 75 |
|  | 79 | 78 | 776 | ${ }^{768}$ |  | 75 |  | 7360 | 7279 | $70 \cdot 715$ |  | 668 | 6895 |  |  |  |  | 792 |  |  |  |
|  | 723 | 71 | 7076 | 6995 | 6913 | 68 | 6749 | ${ }^{666}$ | 658 |  |  |  | 053 |  |  | 116 | 1372 | 158 |  |  |  |
|  |  | 64 | 638 | 63 | 6224 | 61 | 605 |  |  |  |  |  | 4 |  |  | 481 |  | 523 |  |  |  |
|  | 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 80 | 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 38 |  | 36 |  |  | 337 | 329 | 3204 | 317 | 76.30 | 29.83 | 85 |  |  |  |  |  |  |  |  |  |
|  |  | 30 |  |  |  |  |  | 25 | 217 | 77.23 |  | 217 | 23 | 26 | 284 | 307 |  |  | 37 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 | 17 | 166 |  |  |  | 1307 |  | 1126 | 103 |  |  | 945 |  | 99 | ＋145 | 03 | 0606 |  |  |  |  |
| 86 |  | 098 |  |  |  | 06 | 052 | 043 |  | 80. |  |  |  |  | 3794 |  | 426 | 449 |  |  |  |
|  | 03 |  |  |  | 1019 |  |  |  |  |  |  |  |  |  |  |  | 791 | 815 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | $32 \cdot 3$ |  | 42 |  |  |  | 5227 | 546 |  |  |  |
| 90 | 8332 | 8237 | 8141 | 8046 | 7950 | 785 | 7759 | 7663 | 7568 | 83.747 | 32.7414 | 7658 | 900 | 8145 | 8389 | 863 | 8877 | 12 | 936 |  | 90 |
|  | 76 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2284 | 2531 | 2777 |  |  |  |
|  | 69 | 68 |  | 6669 | 6571 | 6474 | 6376 |  |  |  |  |  |  |  |  |  |  | 643 |  |  |  |
|  | 627 | 6178 | ${ }_{5079}^{6079}$ | 5981 | 5882 |  | 5684 |  | 548 | 86．53 | 34．198 | 858 |  |  |  |  |  | 401 | 034 |  |  |
|  | 4906 |  |  |  |  | 440 | 4301 | 420 | 4099 | ${ }_{88}^{87}$ | $34 \cdot 560$ |  | 2475 6118 | 2737 |  |  |  |  |  |  |  |
|  | 490 |  |  |  |  |  |  | 318 |  |  |  |  |  | ，20 |  | 0542 | 0802 | 1062 |  |  |  |
|  | 353 | 3433 | 333 | 3227 | 3124 | 302 | 2918 | 2815 | 2712 | 90.26 | 35 | 31 | 340 |  |  | 4193 | 4456 | 4718 |  |  |  |
|  |  |  |  |  |  | 233 | 22 | 212 | 201 | 91.19 | $35 \cdot 6$ | 678 |  |  |  |  |  |  |  |  |  |
|  |  | 374 | 126 | 1850 | 1056 | 950 | 84 | 0737 | 663 | 93．05 | 3793 | 406 | 433 | 4606 | 1228 | 5148 | 5418 | 5689 | 596 | 231 |  |
|  | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | 37＇ | $36^{\prime}$ | $35^{\text {b }}$ | $34^{\prime}$ |  |  | 31 | $40^{\circ}$ |  |  |  | 36 | 35 | ｜ $34^{\prime}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

|  | Cosine． |  |  |  |  |  |  |  |  |  | Sin |  |  |  |  |  |  |  |  |  | $21^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | 3.7 | $34^{\prime}$ | $35^{\prime}$ | $36^{\prime}$ | 37 | ${ }^{\prime}$ |  | 30 | 31 | 32 | 3：3＇ | 34 | 35 | $36^{\prime}$ | $37^{\prime}$ | $3{ }^{1}$ |  |  |
|  | 930 | 930 | 930 | 93 | 9300 | 929 | 929 | 9297 | 9296 | 29 |  | 3668 | 3670 | 3673 | 3676 | 3679 | 1 | 84 | 3687 | 3689 |  |
|  | 8608 | 8606 | 86 |  |  | 85 | 8596 | 85 | 85 | 1.85 |  | 7335 | 7341 | 7346 | 7352 | 73 | 62 |  | 7373 |  |  |
|  | 7913 | 7909 | 79 |  | 7900 | 789 | 7893 |  |  |  | 995 | 1003 | 1011 | 1019 | 1028 | 1036 | 1044 | 1052 | 60 | 68 |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 4671 | 468 | 469 | 4703 | 4714 | 47 | 4736 | 474 | 4757 |  |
|  | 6521 | 6516 |  |  |  | 649 |  |  | 6478 | $4 \cdot 6473$ | 25 | 8339 | 8352 | 36 | 37 | 8393 | 840 | 342 | 843 | 844 |  |
|  | 58 | 5819 | 5812 | 5806 | 5799 | 5793 | 5787 | 5780 | 5774 | $5 \cdot 57$ |  |  | 2023 | 2039 | 2055 |  |  | 210 | 212 | 213 |  |
|  |  | 51 |  |  |  |  |  |  |  |  |  |  | 5693 | 5712 |  |  |  |  | 5807 | 5826 |  |
|  | 44 |  |  |  |  |  |  |  | 436 |  | $2 \cdot 9320$ | 9342 | 9363 | 9385 | 9407 | 9428 | 9450 | 94 | 9493 | 9515 |  |
|  | 3738 | 37 |  |  |  |  |  |  |  |  |  |  | 3034 |  |  | 硣 |  |  |  |  |  |
| 10 | 30 | 303 |  |  |  |  |  |  |  |  |  |  |  | 673 |  | 6785 |  |  |  |  |  |
| 11 | 2346 |  |  |  |  |  |  |  |  | 10.224 |  | 034 | 037 | 0404 | 0434 | 0464 | 0494 | 0523 |  |  |  |
| 12 | 165 |  |  |  |  |  | 1573 | 1560 | 1547 | 11 |  | 4013 | 40 | 40 | 4110 | 41 | 417 | 4207 | 4240 |  |  |
| 13 | 09 | 094 | －2 | 0913 |  |  | 0871 |  | 0843 | 12 |  | 迷 | 77 | 775 | 7786 | 78 |  | 7891 |  |  |  |
| 14 | 02 |  |  |  |  |  |  |  |  |  |  | 1348 | 13 | 1424 | 146 | 1500 | 1537 | 57 | 1613 |  |  |
| 15 | 956 | 9547 | 9531 |  |  | 9483 | 9466 | 9450 | 9434 | 13 | 75 | 5016 | 50 | 5097 | 513 | 517 | 52 | 525 | 5300 | 53 |  |
| 16 | 886 | 8850 | 8833 | 8816 | 8798 | 8781 | 8764 | 8747 | 8730 | 14.8713 |  |  |  | 8770 | 8813 | 88 | 8900 | 89 | 8986 | 9030 |  |
| 17 | 817 |  |  |  |  |  |  |  | 8026 |  |  |  | 2397 | 2443 | 2489 | 2535 |  | 2627 |  |  |  |
| 18 | 7475 |  |  | 7418 | 7398 | 7379 | 7360 | 7340 | 7321 | 16.730 | 6.5970 | 60 | 6068 | 611 | 61 | 62 | 6262 | 6311 | 636 | 640 |  |
| 19 | 677 |  |  |  |  |  |  |  |  |  |  | 96 |  |  | 9841 | 98 |  | 9995 |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  | 18.58 |  | 3354 |  |  |  |  |  | 3679 |  |  |  |
| 21 | 53 |  | 5343 |  |  |  |  |  |  | 19 | 7.6965 | 7022 | 707 | 7136 | 719 | 7249 |  |  |  |  |  |
| 22 | 469 | 46 | 46 | 462 |  |  | 455 | 45 |  |  |  |  | 07 |  | 086 | 09 | 098 | 104 | 110 |  |  |
| 23 |  |  |  |  |  |  |  |  |  | 21377 | 4295 |  | 4420 | 448 | 4544 | 46 |  | 47 | 4793 |  |  |
| 24 | 330 |  | 3249 | 3223 |  |  | 3146 | 3121 | 309 | 22.306 | 8.7960 | 80 | 80 | 815 | 822 | 8285 | 835 | 8415 |  |  |  |
| 25 | 260 | 2578 | 255 | 2524 | 2498 | 247 | 2444 | 2417 | 2391 | $23 \cdot 236$ | 9．1625 | 16 |  | 1828 | 189 | 1964 | 2031 | 2099 | 2166 | 223 |  |
| 26 | 19 | 1881 | 1853 | 1825 | 1798 | 1770 | 1742 | 1714 | 1686 | 24．1658 | 9．5290 | 5361 | 543 | 550 | 5572 | 5642 | 5712 | 5783 | 5853 | 592 |  |
| 27 | 12 |  |  |  |  |  |  |  |  | 25.0953 |  |  |  |  |  |  |  |  |  |  |  |
| 28 | 0517 | 04 | 0457 | 0427 | 0397 | 0367 | 0337 | 0307 | 027 | 26.0247 | 10.2 | 269 | 27 | 28 | 292 |  |  | 3151 | 3226 |  |  |
| 29 |  |  |  |  |  |  |  |  |  | 26.95 |  |  | 64 |  |  |  |  | 683 |  |  |  |
| 30 | 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0356 | 043 | 051 | 060 | 068 |  |
| 31 | 8429 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 773 |  |  | 763 |  |  | 7528 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 33 |  |  |  |  |  |  | 6826 | 6791 | 675 | 30．6720 | 12.094 | 103 | 112 |  |  |  |  |  | 16 |  |  |
| 34 | 634 | 63 | 626 | 6233 | 61 |  | 612 | 6088 | 605 |  |  | 47 | 479 |  | 497 |  | 51 | 5254 | 5346 |  |  |
| 35 | 564 | 56 | 55 |  |  | 5459 | 22 |  | 5347 | 32.5309 | 12 | 83 | 84 |  | 865 | 8749 | 8844 | 8938 | 9033 |  |  |
| 36 | 4950 | 4912 | 4874 | 4835 | 4797 | 4758 | 4720 | 4681 | 4642 | 33．4604 | 13.1940 | 2038 | 213 | 223 | 2330 | 2427 | 2525 | 2622 | 2720 |  |  |
| 37 | 42 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 35 | 3518 | 3478 | 343 |  |  | 331 | 32 | 323 | 35．3193 |  | 937 |  |  |  |  |  |  | －093 |  |  |
| 39 | 28 |  |  |  |  |  |  |  |  | 36.268 |  |  |  |  |  |  |  | 3674 | 378 |  |  |
| 40 | 21 | 2124 |  |  |  |  |  |  | 1825 | 37－1782 | 14.66 | 6709 |  |  | 7033 | 7142 | 7250 | 7358 | 746 | 757 |  |
| 41 | 1471 |  |  |  |  |  |  |  |  | 38．107 |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 07 |  |  |  |  |  |  |  |  | 39.037 |  |  |  |  |  |  |  |  | 4839 |  |  |
| 43 | 00 |  |  |  |  |  | 9804 |  | 971 | 39.966 |  |  |  |  |  |  |  | 8410 | 852 |  |  |
| 44 | 93 |  | 929 |  |  |  | 9102 | 905 | 9007 | 40 | 16 |  | 149 | 161 | 17 |  |  |  |  |  |  |
| 45 |  |  |  |  |  |  |  |  |  | 41 | 16. | 50 |  |  | 54 | 5534 | 56 | 577 | 5899 |  |  |
| 46 | 7992 |  | 7894 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 47 | 729 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3273 |  |  |
| 48 | 660 | 6549 | 6498 |  |  |  | 629 | 624 | 619 |  | 17.59 | 605 | 618 | 63 | 644 | 657 | 67 | 6830 | 695 |  |  |
| 49 | 590 |  |  |  |  |  |  |  |  | 45.54 |  |  |  |  |  | 02 | 03 | 0514 |  |  |  |
| 50 | 52 | 5155 | 5102 | 5049 | 4995 | 4942 | 4888 | 4835 | 4781 | $46 \cdot 4727$ | 18.3251 | 3386 | 3521 | 3657 | 3792 | 3927 | 4062 | 4198 | 4333 | 446 |  |
| 51 | 45 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 38 |  |  |  |  |  |  |  |  | 48 | 19.0 | 07 | 08 | 10 |  | 128 | 142 | 1565 | 170 | 1547 |  |
| 53 | 31 |  |  |  |  |  |  | 27 |  | 49.26 | 19.4 | 438 |  |  |  |  |  |  |  |  |  |
| 54 | 242 | 23 | 2310 | 2253 |  | 2137 | 2079 | 2021 | 1964 | $50 \cdot 190$ | 19. | 805 | 820 | 83 | 849 | 85 |  | 893 |  |  |  |
| 55 | 173 | 16 |  |  |  |  | 137 | 1318 | 1259 | $51 \cdot 120$ | 20．15 | 17 |  |  | 217 |  |  | 261 | 276 | 291 |  |
| 56 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 033 |  |  |  |  |  |  |  |  |  | 20.89 |  |  |  |  |  |  |  |  |  |  |
| 58 | 964 | 95 | 9518 | 945 |  |  | 9270 | 9208 | 9146 | 53．9084 | $21 \cdot$ | 2728 | 288 | 3042 | 3198 | 335 | 351 | 36 |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  | 54．8378 | 1 |  |  |  |  |  |  |  |  |  |  |
| 60 | 82 | 8187 | 8123 | 8058 |  |  | 7866 | 7802 | 7737 | 73 | 21. | －0 | 0226 | 0388 | 0550 | 0712 | 0875 | 1037 | 19 |  |  |
| 61 | 75 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 685 |  |  |  |  |  |  |  | 63 | $57 \cdot 62$ | ．7 |  |  | 77 |  |  |  |  | 85 |  |  |
| 63 | 616 |  |  |  |  |  |  |  | 5624 | 58.55 | 23 |  |  |  |  |  |  |  |  |  |  |
| 64 | 5467 | 5399 | 533 | 5262 |  | 5125 | 5057 |  |  | 59 | 23 | \％ |  | 10 |  |  |  |  |  |  |  |
| 65 | 477 | 4702 |  |  | 4494 | 4424 | 4355 | 4285 | 421 | 414 | 23 ＇822 | 8402 |  | 875 |  | 910 |  | 9457 | 963 |  |  |
|  | 407 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 析 |  |  |  |  |  |
| 68 | 26 | 261 | 2539 | 24 | 239 | 232 | 224 | 21 | 21 |  |  |  |  |  |  | 114 |  |  |  |  |  |
|  |  |  |  |  |  |  | 546 | 14 | 139 | 64．1324 | 25 |  |  | 34 | 36 | 3819 |  | 41 | 43 |  |  |
| 70 | 1292 | 1218 |  | 1068 |  |  |  |  |  | 65.0618 |  |  |  |  | 7309 | 7498 |  | 7 | 80 | 825 |  |
| 71 | 059 | 052 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 |  | 9824 | 9747 | 96 | 95 | 9516 | 9439 | 93 | 9285 | 66.92 | $26 \cdot 38$ | 40 | 427 | 44 | 46 | 485 | 50 | 52 | 543 |  |  |
| 74 | 950 |  |  |  |  | 15 | 8737 | 8659 | 8580 | $67 \cdot 85$ | $26 \cdot 75$ | 774 | 79 | 813 |  | － | 8731 | 892 | 912 | 93 |  |
| 74 | 850 | 8430 | 8351 | 827 | 8193 | 8114 | 8035 |  |  |  |  |  |  | －18 |  |  |  | － |  |  |  |
| 75 | 7813 |  | 7653 | 7573 | 7493 | 7413 | 7332 | 725 | 7172 | 69.709 | $27 \cdot 48$ | 507 | 528 | 548 | 5688 | 58 | 609 | 629 | 649 | 670 |  |
| 76 | 64 |  |  | 6874 |  | 67 | 6630 | 6549 | 6467 | 70．638 | 27.85 | 874 |  | 91 |  |  |  |  | ， |  |  |
| 77 | 6422 | 56 |  | 5 |  |  | 5928 |  | 5763 | 71.568 | 28.2 | 214 |  | 2831 |  | S | 3456 | 366 | 885 | 40 |  |
| 78 79 | 572 | 56 | 55 | 547 | 539 | 5309 | 5226 | 5142 | 5059 |  |  |  |  | 650 |  |  |  |  |  |  |  |
| 79 |  |  |  |  |  | 4608 | 4523 | 4439 | 4354 | 73．4269 | 28.953 | 975 |  | －17 | 039 | 060 | 08 | 1032 | 124 | 145 |  |
| 80 | 4334 | 4249 | 4163 | 4078 | 39 | 307 | 3821 |  | 3650 | 77368 | 29．3201 | 3 | 363 | ， | － | 428 | 4500 | 471 | 493 | 5180 |  |
| 81 | 3638 | 3552 | 3465 | 3379 |  | 3206 | 3119 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 2942 | 2855 | 27 | 26 | 259 | 2504 | 2417 | 2329 | 2241 | 76.2153 | 30.053 | 0753 | 097 | 19 | － 419 | 1640 | 186 | 208 | 砣 |  |  |
| 83 | 15 | 2158 |  |  |  | ， | 1714 | 1626 | 1537 | $77 \cdot 1448$ | $30 \cdot 419$ | 442 | 464 | 4870 | 509 | 531 | 55 | 576 | 599 | 62 |  |
| 84 | 155 | 146 | 137 | 1282 | 1192 | 1102 | 1012 | 0922 |  | 42 |  | 808 | \％ | 8543 | 8770 | 8997 | 225 | 458 | 967 | 990 |  |
| 85 | 0855 |  |  | 0583 | 0492 | 0401 | 0310 | 021 | 0128 | 79.0037 | 31．152 | 175 | 198 | 221 | 244 | 267 | 290 | 313 | 336 | 359 |  |
| 86 | 159 |  |  | 9884 |  | 9700 | 608 | 9516 | 9423 | 79．9331 | 31.519 | 542 | 565 | 588 |  | 635 |  | 682 | 05 |  |  |
| 87 | 9463 | 9370 | 9278 | 918 |  | 899 |  | 120 | 仡 | 8626 | 31.88 | 9092 | 93 | 956 |  | －03 | 026 | － | 左 | 097 |  |
| 88 | －107 | 8674 |  | 848 | 83 | 8297 | 8203 | 8109 | 8015 | 81 P920 |  |  |  | 235 | 3474 | \％ |  | 4188 | ， |  |  |
|  | 807 | 析 |  |  |  |  | 201 |  | 7310 | 82.7215 | 32.618 | 6427 | 666 | 690 | 7149 | 739 |  | 787 | 811 | 835 |  |
| 90 | 737 | 7280 | 7184 | 7088 |  | 6895 |  | 6702 | 6606 | 183.6509 | $32 \cdot 985$ | ${ }^{0} 095$ | 03 | 058 | 082 | 106 | 131 | 15 | 179 | 204 |  |
|  | 66 | 6583 | 648 | 6389 |  | 194 | 6097 | 59 |  |  |  |  |  |  |  | 4747 |  |  |  |  |  |
| 92 | 5984 | 5806 | 5780 |  | 5591 | 5493 | 5394 | 5296 | 5197 | 85.5099 | 33.718 | 7430 | 7679 | 7928 | 8177 | 8426 | 867 | 892 | 9172 | 942 |  |
| 93 | 5288 | 518 | 509 | 499 | 4891 | 4792 |  | 4393 | 4493 | 86．4393 | 34．084 | 109 | 135 | 160 | 1853 | 2104 | 23 | 26 | 285 | 311 |  |
| 94 | 45 | 4492 | 4392 | 4292 | 4191 | 4090 | 3990 | 3889 | 3788 | 3688 |  | 4766 | 5020 | 527 | 5529 | 5783 | 938 | 62 | 654 | 880 |  |
| 95 | 3897 | 3795 |  |  |  | 3389 | 288 | 3186 | 3084 | 88.2982 | $34 \cdot 817$ | 8433 | 869 | 894 | 9204 | 946 | 97 | 9975 | －23 | 根 | 95 |
|  | 320 |  | 2 |  |  |  |  |  | 2380 | 89－2277 | 35•184 | 2101 | 236 | 26 |  | 3140 | 340 | 365 | 39 | 4， | 96 |
|  | 250 | 240 | 229 | 219 | 2091 | 987 | 1883 | 1779 | 1675 | 90．1571 | 35．5506 | 5769 | 603 | 629 |  | 6818 | 708 | 34 |  |  |  |
| 98 | 180 | 108 |  |  | 1391 | 1286 | 1181 | 1076 | 0971 | 91．0866 | 35.917 | 9436 | 9702 |  | ＋232 | 0497 | 0762 | 1027 | 1292 | 1557 |  |
|  |  | 1008 |  |  |  |  | 7187 | 0373 | 0267 |  | 36．2836 | 310 | 337 | 362 | 39 | 4176 | 4443 | 471 | 4979 | 524 |  |
|  | 0418 | 0311 | 0204 | ＋097 |  | 9884 | 777 | 9669 | 9562 | 92．945 | 36.650 | 6772 | 73 | 7313 | 7584 | 785 | 8125 | 8395 | 8665 | 3936 |  |
|  | $3{ }^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | 27 | $26^{\prime}$ | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ | $22^{\prime}$ | $2 \mathrm{I}^{\prime}$ | ¢ ${ }^{\prime}$ |  |  | 砤 | $26^{\prime}$ | $25^{\prime}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $21^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $21^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | 52 | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | 58 | 59 | 50 | 51 | 52 | 53 | $54^{\prime}$ | $55^{\prime}$ | $56^{\prime \prime}$ | $57^{\prime}$ | $58^{\prime}$ | $59^{\prime}$ |  |
|  | 9283 | 9282 | 9281 | 9279 | 9278 | 9277 | 9276 | 9275 | 9274 | ． 9273 | －3719 | 3722 | 3724 | 7327 | 3730 | 3733 | 35 | 88 | ， | 仿 |  |
|  | 8565 | 8563 | 8561 | 8559 | 8557 | 8555 | 8552 | 8550 | 8548 | $1 \cdot 8546$ | 7438 | 744 | 7449 | 7454 | 7460 | 7465 | 7471 | 7476 | 7481 | 87 | 2 |
| 3 | 7848 | 7845 | 7842 | 7838 | 7835 | 7832 | 782 | 7825 | 7822 | 2.7819 | 11157 | 1165 | 1173 | 1182 | 1190 | 1198 | 1206 | 1214 | 1222 | 1230 | 3 |
|  | 7131 | 7126 | 7122 | 7118 | 113 | 710 | 71 | 7100 | 7096 | $3 \cdot 7092$ | 1.4876 | 488 | 489 | 49 | 4920 | 493 | 49 | 4952 | 4963 | 4973 | 4 |
| 5 | 6413 |  |  |  |  | 6386 |  |  | 6370 | 4.6365 | 59 |  | 862 |  |  |  |  |  |  |  |  |
| 6 | 5696 | 569 | 56 | 56 | 5670 | 5664 | 5657 | 5651 | 56 | 5.5638 | 2.2314 | 233 | 2347 | 2363 | 2379 | 2395 | 2412 | 2428 | 244 | 246 |  |
| 7 | 4979 | 4971 | 4964 | 4956 | 4949 | 4941 | 4933 | 492 | 4918 | 6.4910 | 2.6034 | 60 | 6071 | 6090 | 610 | 61 | 6147 | 6166 | 6185 | 620 |  |
| 8 | 4262 | 4253 | 4244 | 4236 | 4227 | 4218 | 4210 | 4201 | 4192 | 74183 | 2.9753 | 9774 | 9796 | 9817 | 9839 | 9861 | 9882 | 9904 | 9925 | 99 |  |
|  | 3544 | 3535 | 3525 | 351 | 3505 | 3495 | 3486 | 3476 | 3466 |  | 3.3472 | 3496 | 3520 | 3545 | 3569 | 3593 | 3617 | 3642 | 3666 | 36 |  |
| 10 | 2827 | 16 | 05 | 2794 | 2784 | 2773 | 2762 | 2751 | 2740 | $9 \cdot 2729$ | 3.7191 | 721 | 72 | 7272 | 729 | 7326 | 7353 | 7380 | 7407 | 7434 | 10 |
| 11 | 2110 | 2098 | 2086 | 207 | 2062 | 2050 | 2038 | 20 | 2014 | 10.2002 | 10 | 0940 | 0969 | 0999 | 1029 | 1058 | 1088 |  | 1147 | 1177 | 11 |
| 12 | 1392 | 1379 | 1366 | 1353 |  | 1327 | 314 | 130 | 128 | $11 \cdot 1275$ | 4.4629 | 4661 | 469 | 4726 | 4759 | 479 | 4823 | 4856 | 4888 | 4920 | 12 |
| 13 | 0675 | 0661 | 0647 | 0633 | 0619 | 0605 | － | 0576 | 0562 | 12.0548 | 4 －8348 | 8383 | 841 | 8453 | 8488 | 85 | 8559 | 8594 | 8629 | 86 | 13 |
| 14 | 9958 | 9943 | 9927 | 9912 | 9897 | 9882 | 9867 | 985 | 9836 | 12.9821 | 5.2067 | 210 | 21 | 2181 | 2218 | 225 | 2294 | 2332 | 2369 | 240 | 14 |
| 15 | 92 | 9224 | 9208 | 9192 | 9175 | 9159 | 143 | 9127 | 110 | $13 \cdot 9094$ | 5.5786 | 5827 | 5867 | 5908 | 5948 | 59 | 6029 | 6070 | 611 | 615 | 15 |
| 16 | 8523 | 85 | 8488 | 84 | 8454 | 84 | 19 | 8402 | 8384 | 14.8367 | 5.9505 | 95 | 959 | 9635 | 9678 | 972 | 976 | 08 | 9851 | 9894 | 16 |
| 17 | 7806 | 7787 | 776 | 775！ | 7732 | 77 | 7695 | 7677 | 7658 | 15.7640 | 24 | 327 | 33 | 33 | 3408 | 3454 | 3500 | 56 | 91 | 363 | 17 |
| 18 | 7089 | 7069 | 7050 | 7030 | 70 | 6991 | 6971 | 695 | 6932 | 16.6913 | 6.6943 | 699 | 70 | 7089 | 7138 | 718 | 7235 | 728 | 7332 | 738 | 18 |
| 19 | 6371 | 6351 | 6330 | 6309 | 62 | 6268 | 6248 | 6227 | 6206 | 17.6186 | 7.0663 | 0714 | 0765 | 08 | 0868 | 09 | 0970 | 10 | 1073 | 11 | 19 |
| 20 | 565 | 5632 | 5611 | 5589 | 67 | 5546 | 24 | 5502 | 80 | 18.5459 | 7.4382 | 4436 | 4490 | 4544 | 4598 | 465 | 4706 | 4759 | 481 | 4867 | 20 |
| 21 | 4937 | 4914 | 4891 | 4868 | 48 | 4823 | 300 | 477 | 475 | 19 | 8101 | 8157 | 8214 | 82 | 8327 | 838 | 8441 | 84 | 55 |  | 21 |
| 22 | 4219 | 4196 | 4172 | 4148 | 4124 | 4100 | 4076 | 4052 | 4028 | 20.40 | 8．1820 | 187 | 193 | 19 | 2057 | 211 | 2176 | 2235 | 229 | 235 | 22 |
| 23 | 3502 | 3477 | 3452 | 34 | 3402 | 3377 | 3352 | 3327 | 3302 | $21 \cdot 3277$ | 8.5539 | 5601 | 566 | 5725 | 5787 | 584 | 5911 | 5973 | 6035 | 609 | 23 |
| 24 | 278 | 2759 | 2733 | 2707 |  |  | 629 | 260 | 2576 | 22.2550 | 8.92 | 9323 | 938 | 9452 | 9517 | 958 | 96 | 9711 | 977 | 984 | 24 |
| 25 | 206 | 2040 | 2013 | 1986 | 1959 | 32 | 1905 | 1878 | 1850 | 23. | 9．2977 | 304 | 311 | 3179 | 3247 | 331 | 338 | 3449 | 351 | 358 | 25 |
| 26 | 1350 | 1322 | 129 | 126 | 1237 | 1209 | 1181 | 1153 | 1124 | 24 | 9.6696 | 6766 | 683 | 69 | 697 | 7047 | 711 | 7187 | 7257 | 7328 | 26 |
| 27 | 0633 | 0604 | 0574 | 05 | 0516 | 0486 | 57 | 0428 | 0398 | 25.0369 | 10.041 | 048 | 05 | 063 | 0707 | 07 | 08 | 0925 | 0998 | 07 | 27 |
| 28 | 9915 | 9885 | 9855 | 9825 | 9794 | 9764 | 9733 | 970 | 9672 | 25 | 10.413 | 421 | 428 | 436 | 4437 | 451 | 458 | 466 | 473 | 481 | 28 |
| 29 | 9198 | 9167 | 913 | 91 | 9073 | 9041 | 9010 | 89 | 8946 | 26.8915 | 10．7853 | 7932 | 80 | 80 | 8166 | 824 | 83 | 840 | 847 | 85 | 29 |
| 30 | 8481 | 8448 | 8416 | 8383 | 8351 | 18 | 86 | 53 | 8220 | 27.8188 | 11.1572 | 1653 | 173 | 815 | 906 | 1977 | 2058 | 213 | 220 | 230 | 30 |
| 31 | 776 | 7730 | 7696 | 7663 | 7629 | 7596 | 562 | 752 | 749 | 28.74 | 11.5291 | 537 | 54 | 5543 | 5626 | 5710 | 57 | 58 | 1 |  | 31 |
| 32 | 7046 | 7012 | 6977 | 6942 | 6908 | 6873 | 683 | 680 | 676 | 29．673 | 11.901 | 909 | 918 | 9270 | 9356 | 94 | 95 | 9615 | 9701 |  | 32 |
| 33 | 6329 | 6293 | 6258 | 6222 | 6186 | 6150 | 6114 | 6078 | 6043 | $30 \cdot 600$ | 12．2730 | 2819 | 290 | 2997 | 3086 | 317 | 32 | 33 | 34 | 353 | 33 |
| 34 | 5612 | 5575 | 5538 | 5501 | 5464 | 5427 | 5390 | 535 | 5317 | 31.52 | 12.64 | 654 | 663 | 6724 | 6816 | 690 | 69 | 7091 | 疗 | 727 | 34 |
| 35 | 4894 | 4856 | 4819 | 4781 | 4743 | 05 | 667 | 462 | 4591 | 32＊4552 | 13.01 | 026 | 035 | 0451 | 054 | 06 | 073 | 082 | 09 | 10 | 35 |
| 36 | 4177 | 413 | 4099 | 4060 | 4021 | 3982 | 3943 | 3904 | 3865 | 33．3825 | 13 | 3984 | 4081 | 4178 | 4276 | 4373 | 4470 | 4567 | 4664 | 476 | 36 |
| 37 | 3460 | 3420 | 83 | 3340 | 3299 | 3259 | 19 | 179 | 3139 | 34 | $13 \cdot 760$ | 770 | 78 | 7905 | 80 | 810 | 82 | 8305 |  | 850 | 37 |
| 38 | 27 | 2701 | 2660 | 2619 | 2578 | 2537 | 2495 | 2454 | 2413 | $35 \cdot 2$ | 14.132 | 142 | 15 | 16 | 173 | 183 | 19 | 20 | 2185 | 22 | 38 |
| 39 | 202 | 1983 | 1941 | 18 | 18 | 1814 | 1771 | 1729 | 1687 | 36．1644 | 14.50 | 514 | 52 | 53 | 5465 | 557 | 5676 | 578 | 588 |  | 39 |
| 40 | 1308 | 1265 | 1221 | 1178 | 1135 | 1091 | 1048 | 04 | 61 | 37 | 14.8763 | 887 | 8979 | 9087 | 9195 | 9303 | 941 | 51 | 9627 | 9735 | 40 |
| 41 | 059 | 0546 | 502 | 0457 | 0413 | 0368 | 0324 | 0279 | 023 | $38^{\circ} 0190$ | 15.24 | 259 | 270 | 2814 | 292 | 3036 | 31 |  | 3368 |  | 41 |
| 42 | 9873 | 9828 | 9782 | 9737 | 9691 | 9646 |  | 9554 | 95 |  | 15.62 | 631 | 642 | 6542 | 665 | 6768 | 68 | 69 |  | 722 | 42 |
| 43 | 9156 | 9109 | 9063 | 9016 | 8970 | 8923 | 8876 | 8829 | 8783 | 39.873 | 15.9920 | ＋03 | 0153 | 0269 | 038 | 050 | 06 | 0733 | 08 | 09 | 43 |
| 44 | 8439 | 8391 | 8343 | 8296 | 8248 | 8200 | 152 | 8105 | 8057 | $40 \cdot 80$ | 16.363 | 375 | 3877 | 3996 | 4115 | 423 | 4352 | 447 | 459 | 470 | 44 |
| 45 | 7721 | 7673 | 724 | 7575 | 7526 | 7477 | 429 | 7380 | 7331 | $41 \cdot 7282$ | $16 \cdot 7359$ | 7480 | 7602 | 7723 | 7845 | 796 | 8087 | 820 | 833 | 845 | 45 |
| 46 | 700 | 6954 | 6904 | 6855 | 6805 | 6755 | 6705 | 6655 | 6605 | 42.655 | $17 \cdot 107$ | 1202 | 1326 | 1450 | 1574 | 1699 | 1823 | 1947 |  | 219 | 46 |
| 47 | 6287 | 6236 | 85 | 6134 | 6083 | 32 | 5981 | 5930 | 5879 | 43.5828 | 174797 | 4924 | 50 | 51 | 5304 | 5431 | 55 | 85 | 5812 | 5938 | 47 |
| 48 | 5569 | 5517 | 5465 | 5413 | 5361 | 5309 | 5257 | 5205 | 5153 | 44.5101 | $17 \cdot 85$ | 864 | 872 | 89 | 9034 | 9164 | 929 | 9423 | 9552 | 968 | 48 |
| 49 | 4852 | 4799 | 4746 | 4693 | 4640 | 4587 | 4533 | 4480 | 4427 | 45.4373 | 18.2235 | 2367 | 2499 | 2632 | 2764 | 289 | 3028 | 3161 | 329 | 342 | 49 |
| 50 | 4135 | 4081 | 27 | 3972 | 3918 | 64 | 10 | 55 | 701 | 46－3646 | $18 \cdot 5954$ | 089 | 6224 | 63 | 6494 | 662 | 676 | 689 | 703 | 716 | 50 |
| 51 | 3417 | 3362 | 307 | 325 | 3197 | 3141 | 086 | 3030 | 2975 | 47＊291 | 18. | 811 | 9948 | －086 | 022 | 0361 |  | 0637 | 0774 | 99 | 51 |
| 52 | 2700 | 2644 | 2588 | 25 | 247 | 2418 | 2362 | 23 | 22 | 48.2 | 19.339 | 35 | 367 | 3813 | 39 | 40 |  | 43 |  | 46 | 52 |
| 53 | 1983 | 1926 | 1868 | 1811 | 1753 | 1696 | 1638 | 1581 | 1523 | $49 \cdot 1465$ | 19.7111 | 7254 | 739 | 7540 | 7684 | 782 | 797 | 811 | 825 | 839 | 53 |
| 54 | 1266 | 1207 | 1149 | 1090 | 1032 | 0973 | 0914 | 0856 | 0797 | 50.0738 | 20.0830 | 0976 | 1122 | 1268 | 1413 | 1559 | 1705 | 1851 | 199 | 214 | 54 |
| 55 | 0548 | 0489 | 0429 | 0370 | 0310 | 0250 | 0191 | 0131 | 0071 | 51．0011 | 20.4549 | 4698 | 4846 | 4995 | 5143 | 5292 | 5440 | 558 | 573 | 588 | 55 |
| 56 | 983 | 97 | 9710 | 9649 | 9588 | 9528 | 9467 | 9406 | 9345 | 51 | 20.8268 | 842 | 85 | 87 | 88 | 275 | 91 |  |  | 962 | 56 |
| 57 | 9114 | 9052 | 8990 | 28 | 8867 | 8805 | 43 | 681 | 8619 | 52 | 21－1988 | 2141 | 2295 |  | 2603 | 2757 | 2911 | 3064 | 37 | 337 | 57 |
| 58 | 8396 | 8334 | 8271 | 8208 | 8145 | 8082 | 8019 | 795 | 7893 | 53．7830 | 21－5707 | 5863 | 6020 | 6176 | 6333 | 6489 | 6646 | 6802 | 695 | 71 | 58 |
| 59 | 7679 | 7615 | 7551 | 7487 | 7423 | 59 | 7295 | 7231 | 7167 | 54．7103 | 21.9426 | 9585 | 9744 | 9904 | －063 | 0222 | 0381 | 0540 | 070 | 厘 | 59 |
| 60 | 6962 | 6897 | 6832 | 67 | 6702 | 6637 | 6571 |  | 6441 | 55：6376 | $22 \cdot 3145$ | 3307 | 3469 | 363 | 379 | 3955 | 4117 | 4278 | 444 | 460 | 60 |
| 61 | 6244 | 6178 | 12 | 6046 | 5980 | 5914 | 5848 | 5781 | 5715 | 56.56 | 22＇6864 | 702 | 7193 | 7358 | 752 | 7687 | 785 |  |  |  | 61 |
| 62 | 5527 | 5460 | 5393 | 5326 | 525 | 519 | 5124 | 5056 | 498 | 57．4922 | 23.058 | 075 | 09 | 108 | 125 | 142 | 15 | 17 | 19 | 208 | 62 |
| 63 | 4810 |  | 4673 | 4605 |  | 4468 |  | 4332 | 4263 | 58．419 | $23 \cdot 4302$ | 4472 | 4642 | 4812 | 4982 | 5152 | 5322 | 5492 |  | 583 | 63 |
| 64 | 4093 | 4023 | 3954 | 3885 | 3815 | 3746 | 3676 | 3607 | 3537 | 59－3467 | 23•8021 | 8194 | 8367 | 8539 | 8712 | 8885 | 9058 | 9230 | 9403 | 957 | 64 |
| 65 | 3375 | 3305 | 3235 | 31 | 3094 | 3023 | 2952 | 2882 | 2811 | 60．2740 | $24 \cdot 1740$ | 1916 | 2091 | 2267 | 442 | 2618 | 2793 |  | ， | 331 | 65 |
| 66 | 2658 | 2587 | 2515 | 244 | 2372 | 200 | 2229 | 215 | 2085 |  | 24.545 | 5637 | 5816 | 5994 | 6172 | 6350 | 6528 | 6706 | 68 |  | 66 |
| 6 | 1941 |  | 107 | 10 |  |  |  | 1 |  | $62 \cdot 12$ | 24.91 | 矿 | － | 972 | 9732 | ＋083 |  |  |  |  | 67 |
| 68 | 1223 | 1150 | 1076 | 10 | 0929 | 0855 | 078 | 0707 | 0633 | 63．055 | $25 \cdot 289$ | 3081 | 3265 | 3448 | 3632 | 3815 | 3999 | 4182 | 436 | 454 | 68 |
| 69 | 0506 | 0431 |  |  |  | 0132 | 5 5 | 9982 | 990 | 63.9832 | 25.6616 | 6803 | 6989 | 7175 | 7362 | 7548 | 7734 | 920 | 106 | 29 | 69 |
| 70 | 9789 | 9713 | 9637 | 9561 | 9485 | 9409 | 333 | 9257 | 9181 | 64.9105 | $26 \cdot 0336$ | 052 | 0714 | 0903 | 109 | 128 | 146 | 1658 | 184 | 203 | 70 |
| 71 | 9071 | 8995 | 8918 | 341 | 64 | 887 | 8610 | 8532 | 8455 | 65.8378 | $26 \cdot 405$ | 4246 | 443 |  | 482 |  | 5205 |  |  |  | 71 |
| 72 | 8354 | 8276 | 8198 | 8120 | 8042 | 7964 | 7886 | 7807 | 7729 | 66.7651 | 26.7774 | 796 | 8162 | 8357 | 855 | 8746 | 8940 | 9134 | 93 | 952 | 72 |
| 73 | 7637 | 7558 | 7479 |  | 7320 | 7241 | 7162 | 7083 | 7003 | 67•6924 | 27－1493 | 1690 | 1887 | 2084 | 2281 | 247 | 2675 | 2872 | 060 | 仡 | 73 |
| 74 | 6920 | 6839 | 675 | 6679 | 6599 | 6518 | 6438 | 6358 | 6277 | 68．6197 | $27 \cdot 5212$ | 5412 | 5611 | 5811 | 601 | 6211 | 6410 | 6610 | 6810 | 700 | 74 |
| 75 | 6202 | 6121 | 6040 | 5959 | 5877 | 5796 | 5714 | 5633 | 51 | 5470 | $27 \cdot 8931$ | 913 | 9336 | 9538 | 97 | 9943 | ．146 | 034 | 05 | 075 | 75 |
| 76 | 5485 | 5403 | 5320 | 5238 |  | 5073 | 499 | 4908 | 4825 | 70.4743 | $28^{\circ} 265$ | 2855 | 3060 | 3266 | 3471 | 3676 | 3881 | 4086 | 4291 | 449 | 76 |
| 77 | 4768 | 4684 | 4601 | 4517 | 4434 | 4350 | 4267 | 4183 | 4373 | 714015 | 28.636 | 6577 | 6785 | 9993 | 7201 | 7408 | （351 | 882 | 1772 |  | 77 |
| 78 | 4050 | 3966 | 3881 | 3797 | 3712 | 3628 | 3543 | 3458 | 3373 | 72•3288 | 29•0088 | 0299 | 0509 | 0720 | 0930 | 1141 | 1351 | 1562 | 1772 | 198 | 78 |
| 79 | 3333 | 3248 | 3162 | 3076 | 91 | 2905 | 2819 | 2733 | 2647 | 73.2561 | 29.3807 | 4021 | 4234 | 4447 | 4660 | 4874 | 5087 | 530 | 551 | 572 | 79 |
| 80 | 2616 | 2529 | 2442 | 2356 | 2269 | 2182 | 2095 | 2008 | 1921 | 74.1834 | 29.7526 | 7742 | 7958 | 817 | 839 | 8606 | 882 | 903 | 925 | 947 | 80 |
| 81 | 1898 | 1811 | 1723 | 1635 | 1547 | 1459 | 1371 | 1283 | 1195 | 75．1107 | 30．1245 | 1464 | 1683 | 1901 | 212 | 233 | 2557 | 277 | 2994 | 32 | 81 |
| 81 | 1181 | 1092 | 1024 | 0915 | 0826 | 0737 | 0648 | 0559 | 0469 | 76.0380 | 30.4964 | 5186 | 5407 | 5629 | 5850 | 6071 | 6293 | 6514 | 6735 | 695 | 82 |
| 83 | 0464 | 0374 | 0284 | 0194 | 0104 | ＋014 | 9924 | 9834 | 9743 | 76.9653 | 30．8684 | 8908 | 9132 | 935 | 9580 | 9804 | ＋028 | 25 | 426 | 070 | 83 |
| 84 | 9746 | 9656 | 9565 | 9474 | 82 | 9291 | 200 | 9109 | 9017 | $77 \cdot 8926$ | 31－2403 | 2630 | 2856 | 3083 | 3310 | 3536 | 3763 | 3990 | 4216 | 4443 | 84 |
| 85 | 90 | 8937 | S |  | 8661 | 8569 | 8476 | 8384 | 829 | 78：8199 | $31 \cdot 6122$ | 6351 | 6581 | 681 | 704 | 726 | 749 | 772 | 7957 | 8186 | 85 |
| 86 | 8312 | 8219 | 8126 | 032 | 939 | 7846 | 7752 | 7659 | 7565 |  | 31．9841 |  | 0305 |  | 0770 | 1002 | 1234 | 46 | 1698 |  | 86 |
| 87 | 7595 | 7500 | 74 | 7312 | 7218 | 7123 | 7029 | 6934 | 6839 | $80 \cdot 6745$ | 32.3560 | 3795 | 4030 | 4265 | 4499 | 4734 | 4969 | 5204 | 5438 | 561 | 87 |
| 8 | 6877 | 6782 | 596 | 5871 | 6476 | 6460 | 6305 | 6209 | 6113 | 81.6018 | 32．7279 | 7517 | 7754 | 7992 | 8229 | 8467 | 8704 | 894 | 9179 | 9416 | 88 |
| 89 | 6160 | 6064 | 5967 | 5871 | 5774 | 5678 | 5581 | 5484 | 5387 | 82.5291 | 33.0998 | 1238 | 1479 | 1719 | 1959 | 2199 | 2439 | 268 | 2920 | 316 | 89 |
| 90 | 5443 | 5345 | 5248 | 5150 | 5053 | 4955 | 4857 | 4759 | 4661 | 83.4564 | 33．4717 | 4960 | 5203 | 5446 | 5689 | 5932 | 6175 | 6418 | 6660 | 6903 | 90 |
| 91 | 4725 | 4627 | 4528 | 4430 | 4331 | 4232 | 4133 | 4034 | 3935 | 84•3836 | $33 \cdot 8436$ | 8682 | 8928 | 917 | 9419 | 9665 | 9910 | －15 | 0401 | 064 | 91 |
| 92 | 4008 | 3908 | 3809 | 3709 | 3609 | 3509 | 3410 | 3310 | 3209 | 85.3109 | 34－2155 | 2404 | 2652 | 290 | 3149 | 3397 | 3645 | 389 | 4142 | 439 | 92 |
| 93 | 3291 | 3190 | 3089 2370 | 2989 | 2888 | 2787 | 2686 | 2585 | 2483 | 86.2382 | 34．5874 | 6126 | 6377 | 6628 | 6879 | 7130 | 738 | 763 | 788 | 8133 | 93 |
| 94 | 2573 | 2472 | 2370 | 2268 | 2166 | 2064 | 1962 | 1860 | 1758 | $87 \cdot 1655$ | 34－9593 | 9847 | 1101 | 0355 | 0609 | 0862 | 1116 | 136 | 162 | 187 | 94 |
| 95 | 1856 | 1753 | 1650 | 1547 | 1444 | 1341 | 1238 | 1135 | 175 | $88^{\circ} 0928$ | 35．3313 | 3569 | 3826 | 4082 | 433 | d | 4851 | 510 | 5364 | 137 | 95 |
| 96 | 1139 | 1035 | 0931 | 0827 | 0723 | 0619 | 0514 | 0410 | 0306 | 89.0201 | 35.7032 | 7291 | 7550 | 8509 | 8068 | 8327 | 8586 | 8845 | 9104 | 936 | 96 |
| 97 | 0422 | 0317 | 0212 | 0106 | 1001 | 9896 | 9791 | 9685 | 9580 | 89.9474 | 36.0751 | 1013 | 1274 | 1536 | 1798 | 2060 | 2322 | 2583 | 2845 | 3107 | 9 |
| 98 | 9704 | 9598 8880 | 9492 | 9386 | 9280 | 9173 | 9067 | 960 | 8854 | 90.8747 | $36 \cdot 4470$ | 4734 | 4999 | 526 | 5528 | 5793 | 6057 | 6321 | 6586 | 6850 | 98 |
|  | 8987 8270 | 8880 8161 | 8773 8053 | 78665 | 8558 7836 | 8450 | 8343 | 8235 | 8128 | 91－8020 | 36.8189 | 8456 | 8723 | 8991 | 9258 | 9525 | 9792 | ＋059 | 0326 | 0594 | 99 |
| 100 | 8270 | 161 | 8053 | $\frac{7945}{7}$ | 仡 | 28 | 7619 | 7510 | 402 | $\frac{92 \cdot 7293}{19}$ | $37 \cdot 1908$ | 2178 | 2448 | 2718 | 2988 | 3258 | 3528 | 3797 | 4067 | 4337 | 100 |
|  |  |  |  |  |  |  |  |  | 2 | 1 | 10 | 9 | 8 | ？ | 6 | 5 | 4 | 3 | $2^{\prime}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $8^{\circ}$ |

TRAVERSE TABLES.

| $22^{\circ}$ |  |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8544 |  |  |  |  |  |  |  |  |  |  |  | ${ }_{7503}^{3751}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 7773 |  |  |  |  | ${ }^{1254}$ | 262 |  |  |  |  |  |  |  |
|  |  |  | ${ }_{6348}$ |  | 707 |  |  |  |  |  |  | 874 | 500 | 3771 |  |  |  |  | 8838 |  |  |
|  | 5631 | 5624 | 5618 | 5611 | 5605 | 5598 | 5592 | 5585 | 5579 |  | $2 \cdot 2$ |  | 2509 | 2525 | 2541 | 2557 | ${ }^{2573}$ |  | $\left.{ }^{2606}\right]^{2}$ |  |  |
|  | 4175 | ${ }_{4}^{4895} 4$ | ${ }_{4888}^{485}$ | ${ }_{4}^{4880}$ | 4 | 4131 | 4122 | 484 |  |  |  | 0 | 12 | 0279 | 5 | 76 | ${ }^{3} 8$ | 20 | 1141 |  |  |
|  | ${ }_{2718}^{347}$ |  |  | ${ }_{2686}^{364}$ |  |  |  |  | 3368 |  |  | 3739 |  |  | 12 |  |  |  |  |  |  |
|  | ${ }^{1990}$ | ${ }^{19778}$ | ${ }^{1936}$ | ${ }^{1954}$ | ${ }^{1942}$ | 1930 | 198 | 1906 | 1894 |  | $4 \cdot 1207$ | ${ }^{1236}$ | ${ }^{1266}$ | 20s | 25 | 5 535 | ${ }^{1385}$ | 1414 | 1444 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 4885 |  | 5050 |  |  |  |  |  |  |  |
|  | 2534 | 9770 | ${ }^{0} 775$ | 9760 | ${ }_{9745}^{047}$ | ${ }^{2} 4729$ | 0714 |  | 9683 |  | $5 \cdot 243$ | ${ }^{8734}$ | 252 | 2858 |  | ${ }^{8834}$ |  |  |  |  |  |
|  | 9078 |  | 9045 |  |  |  |  | 8963 | 8946 |  | $5 \cdot 619$ |  |  |  |  |  |  |  | 6514 |  |  |
|  |  | ${ }^{8332}$ | $\begin{aligned} & 83155 \\ & 7584 \end{aligned}$ | ${ }^{2297}$ | ${ }^{8280}$ | ${ }^{8262}$ | ${ }^{3245}$ | ${ }^{3227}$ | 8270 | 14 : | 5•9937 | 980 | +023 |  |  | $0^{0153}$ | 0196 |  |  |  |  |
| 18 | ${ }_{683} 62$ |  |  |  |  |  |  |  | 36 |  |  | 3729 |  | 5875 | ${ }^{3868}$ | 7672 | 7720 | 7789 | 481 |  |  |
|  |  | 6144 | 6123 | 6103 | 6082 |  | 6040 |  |  |  |  |  | 1278 | 1329 | 1380 | 1431 | 1483 | 153 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4709 | ${ }^{4} 85$ | 463 | 464 |  |  |  |  |  |  | 7.8667 |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 23 \\ & 23 \\ & 23 \end{aligned}$ | 325 | 3227 |  |  | 3152 |  |  |  | 3051 |  | ${ }_{8}^{8.6}$ | ${ }_{6222}^{262}$ | S4 | 6346 | 208 | 70 | 6532 | 2594 |  |  |  |
|  | ${ }^{2524}$ | (1769 | ${ }_{1741}^{2472}$ | 1714 | ${ }_{1687}^{249}$ | 1660 | 163 | 1605 | 157 |  | ${ }^{-3} 36$ |  | 2038 | 354 |  | \| 20229 | ${ }_{4056}^{0294}$ |  |  | 4258 |  |
|  | 1068 | $\begin{aligned} & 1035 \\ & 0314 \end{aligned}$ |  | 0983 | 095 |  | 0897 |  | 0840 | 24.881 | 9.7398 |  |  |  | 7678 | 17748 | 17818 | 7888 | 7988 |  |  |
| ${ }_{28}^{27}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8883 |  |  |  |  |  |  |  | 8380 |  |  |  |  | 887 |  |  |  | 83 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7427 | 73 | 7359 | ${ }^{7326}$ |  | 7258 | 7224 |  |  |  | 11.6128 | ${ }^{6212}$ | ${ }^{6295}$ | 379 | 62 | $6^{6546}$ | ${ }^{6630}$ | 6713 | ${ }^{6797}{ }^{6}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 34 |  |  |  |  |  |  |  |  |  |  |  | 7458 |  | 7641 | \%3 | 7825 |  | 8008 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 37 | 30 |  |  |  | ${ }_{2897}$ |  | 2816 | ${ }^{2775}$ | 2735 |  |  | 04 |  | 504 | 04 |  |  | 303 | 9402 |  |  |
|  | 2330 | 2288 | 2247 | 2206 | 216 |  |  | 2039 | 198 |  |  |  |  |  |  | 63 | 65 |  |  |  |  |
|  | (1002 | 1585 | 1577 | 1474 |  |  |  | ${ }^{1358}$123 <br> 058 |  | ${ }^{36.7218}$ | 14.984 |  | .058 |  | 274 |  | ${ }_{0490}^{6727}$ |  |  |  |  |
|  | 010 | ${ }^{0101}$ | ${ }^{0056}$ | P011 | ${ }^{9966}$ |  | 9877 | ${ }^{9832}$ | 97885 |  | $15 \cdot 3589$ | 3699 | 3810 | 3920 | 4031 | 4141 | ${ }^{4252}$ | ${ }^{4362}$ | ${ }^{4473}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 44 | 79 | 7913 | 7865 | 78 | 77 |  |  |  | 7576 | 40. |  | 4946 |  | 518 | 5301 | 5420 | 5539 | 5657 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 6.8573 |  |  |  |  |  |  |  |  |  |  |
|  | 5730 | S 472 | 5404 | ${ }^{6354}$ | - 537 |  | 54 | ${ }_{5}^{1 / 5}$ | ${ }^{610}$ |  |  | 243 | 2567 |  |  | $2039$ |  |  |  |  |  |
| 48 | 5048 | 4996 | ${ }_{4944} 4$ | 489 | 4839 |  | 43 | 468 | 4629 | 4 |  | 9941 | 070 | 0,199 | 29 | ${ }_{0458}^{6099}$ | ${ }_{0588} 0$ | 0717 | ${ }_{0} 846$ |  |  |
|  |  |  |  |  |  |  |  |  | 3892 |  |  | 368 | 3821 |  |  |  |  |  |  |  |  |
|  | 2864 | 288 | 2753 |  |  |  |  | ${ }^{2744}$ | ${ }^{2418}$ |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{5}^{52}$ |  |  | ${ }^{2022}$ | 1235 | 1190 | 18182 | 1795 | ${ }^{1738}$ | 1094 | 88.18. | 19 | ${ }^{48364}$ | ${ }^{5827}$ |  | 13 |  | 5039 | 5777 | 17 |  |  |
| 54 | 067 | ${ }_{0} 020$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 83 |  | 711 |  | 959 |  |  | 50.94 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | ${ }^{873}$ |  |  |  |  |  |  |  |  |  |  |  |  |
| $\left.\begin{aligned} & 57 \\ & 58 \end{aligned} \right\rvert\,$ |  |  |  |  |  |  |  |  | 799 |  |  | 3679 | ${ }^{383}$ | $\left\lvert\, \begin{aligned} & 398 \\ & 774 \end{aligned}\right.$ | ${ }_{7}^{484}$ | ${ }^{42954}$ | ${ }^{44488}$ | 4601 |  |  |  |
| 59 | 7039 | 6974 | 6940 | ${ }_{6845}$ | 5781 |  |  | ${ }_{658}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 179 |  |  |  |  |  | 5786 | 55:572 | 2 2:47 |  |  |  |  |  |  |  |  |  |  |
|  | 558 |  | 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 64 |  |  |  | 318 | 3118 |  |  |  | 2838 |  |  |  |  |  | 0439 | 0611 | 0784 |  | 1128 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 121 | 1140 | 108 | O294 |  |  | 0774 | O701 | ${ }^{0627}$ |  |  |  |  | 8 |  | 1890 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 989 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{9029}^{957}$ |  |  |  | 8723 | ${ }_{8647}^{9380}$ |  | ${ }_{843} 929$ | ${ }_{8417}^{9154}$ | 648 |  |  | 885 |  | 2980 |  |  |  |  |  |  |
|  | ${ }^{830}$ | 822 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 74 | 6116 | 603 | 5955 | 587 | 5793 | 5712 | 563 | 5550 | 5469 | 68.5 |  | 7608 | 7608 | 7808 | ${ }_{8007}^{48}$ | ${ }_{8206}$ | ${ }_{8406}$ | 880 |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 69465 |  |  |  |  |  |  |  | 237 | 2572 |  |  |
|  |  |  |  |  |  |  | ${ }^{4162}$ |  | 3995 |  |  |  |  |  |  |  |  | ${ }^{6} 935$ |  |  |  |
| $\begin{gathered} 778 \\ 78 \end{gathered}$ | 32 | 3118 | 303 | ${ }_{2948}^{3208}$ | ${ }_{283} 38$ | 8 | 2692 | 2607 | 2521 | 72 |  | ${ }_{240}^{203}$ | 2614 |  | 3034 | 3245 | 3455 |  | 3375 |  | 8 |
|  |  |  |  |  | 2130 | 2044 | 1958 | 1871 | 1785 |  | 2985 |  | 析 | 6537 |  |  | 097 | 研 |  |  |  |
|  | 1 | 093 | 0842 |  |  |  | ${ }^{0.4888}$ |  |  |  |  | ${ }^{3350}$ | ${ }^{386}$ |  |  |  | ${ }^{47742}$ |  |  |  |  |
|  |  |  |  | 020 |  |  |  |  |  |  |  |  |  | 8 |  |  |  |  |  |  |  |
| ${ }_{84} 8$ |  |  |  |  |  | 8376 | 8284 | 8192 | 831 |  |  | ${ }_{489}$ | 5123 | 5349 | 5576 | 5802 | ${ }^{2268}$ | ${ }_{625}^{245}$ |  |  |  |
| 85 |  | 8014 | 7921 |  |  |  | 7549 | 7456 | 7363 |  | 31.841 | $\left.\right\|_{8845}$ |  | , | 933 | 956 | 9791 | .02 | O24 |  |  |
|  |  |  |  |  | 708 |  | 88 | 672 | ${ }^{6626}$ |  |  | 2394 |  | 2857 | 3089 | ${ }^{3321}$ |  | ${ }^{378}$ | 4016 |  | ${ }_{8}^{86}$ |
| $\begin{gathered} 87 \\ 88 \\ 88 \end{gathered}$ | 592 | 582 | 573 | ${ }^{63634}$ | 553 | 5441 | ${ }_{5345}^{0035}$ | ${ }_{5249}^{588}$ | 5152 |  |  | ${ }_{989}^{694}$ | ${ }_{128}{ }^{23}$ | ${ }_{036}^{6012}$ | 0803 | 17880 | 1077 |  |  |  |  |
|  |  |  |  | 4902 | 480 | 4708 | 4610 | 4513 | 4416 | 82 |  |  |  | 4120 |  | 4600 | 4840 |  |  |  |  |
|  |  | 36 | ${ }^{353}$ |  |  |  |  |  | 2942 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 300 | 290 | 280 | 27 |  |  |  |  |  |  |  |  |  |  |  |  |  | 637 |  |  |  |
|  |  | 128 | ${ }^{2074}$ | 124 |  | $17{ }^{3}$ | ${ }^{1}$ | ${ }^{2} 834$ | 10731 | ${ }^{87}$ |  | ${ }^{2388}$ | 2633 | 289 |  |  |  | ${ }^{1 / 39}$ |  |  |  |
| 9594 | ${ }^{1083}$ | 1072 | 061 | ${ }_{051} 124$ | 0410 | 0306 | 0202 | 1098 | 9994 | 87.98 | 35.5876 | 113 | 538 | 664 | 6901 | 7357 | 143 | 769 | 7925 |  |  |
|  |  |  |  |  |  |  |  |  | 92 |  |  |  | 140 |  |  |  |  |  |  |  |  |
|  | 936 | ${ }_{23}^{263}$ |  |  |  |  |  |  |  |  |  | - 363 | 3892 | ${ }^{4} 153$ | ${ }_{8}^{44,1 / 5}$ | ${ }^{4676}$ |  |  |  |  |  |
|  |  | ${ }^{7} 838$ | 769 |  |  | 63 |  | 7155 |  |  |  | 28 | l 384 | 1651 | 1928 | ${ }_{2}^{2495}$ |  |  |  |  |  |
|  |  |  |  |  | ${ }^{56}$ | 55 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $22^{\circ}$ Cosine． | －Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $22^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11^{\prime}$ | 12 | $13^{\prime}$ | $14^{\prime}$ | 15 | 16 | $17^{\prime}$ | $18^{\prime}$ | 19 | $10^{\prime}$ | $11^{\prime}$ | $12^{\prime}$ | 13＇ | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ |  |  |  |  |
|  | 9261 | 9260 | 92 | 9258 |  |  |  |  | 9252 | 925 | 3773 | 37 | 3778 | 378 | 3784 | 3786 | 3789 | 3792 | 3795 | 3797 |  |
|  |  | 85 | 85 | 85 | 8513 |  |  |  | 85 | －8502 |  | 755 | 75 | 756 | 75 | 7573 | 757 |  | 7589 | 7595 |  |
|  | 7783 | 77 | 7776 | 7773 | 777 | 7766 | 77 | 7760 | 77 | 2775 | 11319 | 1327 | 1335 | 1343 | 13 | 1359 | 136 | 1376 | 1384 | 1392 |  |
|  | 7044 |  | 703 | 7 |  |  |  |  |  |  | $1 \cdot 5092$ | 5103 | 511 | 5124 | 513 | 5146 | 5157 | 51 | 5178 | 518 |  |
| 5 |  |  |  |  |  |  |  |  |  | 4.6255 | －885 | 8879 | 889 | 89 | 89 | 8932 | 8946 | 8959 | 8973 | 8986 |  |
| 6 | 5565 | 5559 | 5552 | 5546 | 5539 | 5532 | 5526 | 5519 | 5513 | $5 \cdot 550$ | 2.2638 | 2654 | 2670 | 2687 | 2703 | 2719 | 2735 | 2751 | 2767 | 2784 |  |
| 7 | 48 | 481 | 48 | 480 | 479 | 4 | 47 | 477 |  |  |  |  | 644 | 6468 | 6487 |  | 65 | 654 | 6562 |  |  |
|  | 408 |  |  |  | 405 |  |  |  |  |  |  |  | 022 | 024 | 0270 |  | 031 | 0335 | 0356 | 0378 |  |
|  | 3348 | 3338 | 3328 | 33 | 3309 | 329 | 3289 | 32 | 3269 |  | 3 19 | 3981 | 400 | 4030 | 4054 | 4078 | 410 | 4127 | 415 | 417 |  |
| 10 | 2609 | 2598 | 258 | 257 | 2585 | 2554 | 2543 | 2532 | 2521 | 925 |  | 7757 | 778 | 7811 | 7838 | 7865 | 7892 | 7919 | 7946 | 7973 | $\underline{10}$ |
| 11 | 18 | 185 | 184 |  |  |  |  | 17 | 1773 | 10 | $4 \cdot 1503$ | 1533 | 156 | 1592 | 1622 | 1651 | 1681 | 1711 | 1740 | 1770 | 11 |
| 12 | 11 |  |  |  |  |  |  | 103 |  | 11.101 | ， | 5309 | S | 53 | 54 | 54 | 547 | 5502 | 5535 | 5567 | 12 |
| 13 | 0392 | 0377 | O36 | O34 |  | 0320 | 0306 | O29 | 0277 | ， |  |  | 91 | 915 |  | 9224 | 925 | 92 | 9329 |  |  |
| 14 | 96 |  | 9622 |  |  |  |  |  | 9529 |  |  | 2860 | 2898 | 293 | 2973 | 3011 | 3048 | 3086 | 3124 | 3162 |  |
| 15 | 891 | 97 | 8881 | 8864 | 8848 | 8831 | 8815 | 8798 | 8781 | 13 | 5.6595 | 6636 | 667 | 671 | 6757 | 67 | 683 | 68 | 69 | 6959 | 15 |
| 16 | 817 | 8157 | 8139 | 8122 | 8104 | 8086 | 8069 | 80 | 8034 |  |  |  | 0455 |  | 0541 | 0584 | 0627 | 0670 | 0713 | 0756 | 16 |
| 17 | 7435 |  |  |  |  |  |  |  |  |  |  |  | 4233 | 279 | 4324 |  | 4416 | 4462 | 4508 | 4553 |  |
| 18 | 669 | 66 | 665 |  | 661 | 6597 | 65 | 655 | 653 | 16.65 | 6.914 |  | 80 | 8060 | 810 | 81 | 8205 | 8254 | 8302 | 835 | 18 |
| 19 | 5957 | 59 | 5915 |  |  |  |  | 58 |  | 17.576 | 7－1687 |  | 179 | 1841 | 189 |  | 199 |  |  | 2148 | 9 |
| 20 | 52 |  |  |  |  |  |  |  |  | 18.5020 |  | 5514 | 556 | 5622 | 5676 | 57 | 578 | 58 | 5891 | 5945 | 20 |
| 21 | 44 | 4456 | 4433 | 4410 | 4387 | 4364 |  | 4317 | 4294 | 19．427 | 7.9233 | 9290 | 9347 | 9403 | 9460 | 9516 | 9573 | 9620 | 968 | 974 | 21 |
| 22 | 374 | 3716 | 3692 | 366 | 364 |  |  |  | 354 | $20 \cdot 352$ |  |  | 312 |  |  |  | 3362 | 34 |  |  | 22 |
| 23 | 300 | 29 | 2950 | 2925 |  |  |  | 273 |  | 21.277 |  |  |  | 6965 |  |  | 7151 |  |  |  | 23 |
| 24 | 226 | 2235 | 2209 | 2183 | 2156 | 2130 | 2103 | 777 | 2050 | 22.202 | 953 | 0617 | 068 | 0746 | 0811 | 08 | 09 | 1005 | 1069 | 113 | 24 |
| 25 | 1523 | 1495 | 1468 |  | 1413 | 1385 | 1358 | 1330 | 1302 | 23 | 9.4326 | 4393 | 4460 | 45 | 45 | 46 | 472 | 47 | 4864 | 493 | 25 |
| 26 | 07 | 0755 | 0726 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 00 |  |  |  |  |  |  |  |  |  | 10 |  |  |  |  |  |  |  |  |  |  |
| 28 | 93 | 9275 | 924 | 9213 | 9182 |  | 9120 |  |  | 25 | $10 \cdot 56$ |  | 5795 | 5871 |  | 6022 | 609 | 617 | 6248 | 632 | 28 |
| 29 | 56 |  | 析 | 871 |  |  |  |  | 8311 | 26 | 10 | 9181 | 935 | 9652 |  |  |  |  |  |  |  |
| 30 | 782 | 779 | 7761 | 7728 | 7695 | 62 | 629 | 7596 | 563 | 27 | 11 | 3271 | 335 | 343 | 351 | 3595 | 367 | 375 | 3837 | 391 | 30 |
| 31 | 7088 | 7054 | 7020 | 6986 | 6952 | 6918 | 6883 | 6849 | 6815 | 28.6781 | 11 | 7047 | 7131 | 7214 | 7298 | 738 | 746 | 754 | 763 | 7715 | 31 |
| 32 |  |  | 6279 | 624 |  |  |  | 610 |  |  |  |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 5610 | 55 | 5537 | 550 |  | 5428 |  | 5356 | 5319 | $30 \cdot 528$ | 12 |  | 468 | 477 | 4865 |  | 5043 |  |  |  |  |
| 34 | 4871 | 48 | 4796 | 475 | 472 | 4684 | 4646 | 4609 | 457 | 31．45 | 12 |  | 846 | 8557 |  | 8741 | 88 | 892 |  | 9107 |  |
| 35 | 4132 | 4093 | 4055 | 4016 | 3978 |  |  | 3862 | 3823 | $32 \cdot 3785$ | 13.2056 |  |  | 2339 | 2433 | 2527 | 2621 | 2715 | 2810 | 2904 | 35 |
| 36 | 3392 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 36 |
| 37 | 26 |  | 25 | 253 |  |  |  |  |  |  |  |  |  |  |  |  |  | 02 |  |  | 37 |
| 38 | 19 | 18 |  | 178 |  |  |  | 1622 | 1580 | 35.15 | 14.3 |  |  | 36 |  | 3886 | 398 | 40 |  | 429 | 38 |
| 39 | 1175 |  | 1090 | 1047 |  |  |  |  | 0832 |  | $14 \cdot 71$ |  |  | 746 | 75 | 763 | 777 | 788 |  | 809 | 39 |
| 40 | 0436 | 03 | 0348 | 0304 | 02 | 0216 | 0172 | 0128 | 008 | 37 | 15.09 | 102 | 113 | 124 | 135 | 145 | 156 | 167 | 178 | 189 | 40 |
| 41 | 9697 | 9652 | 9607 | 9562 | 9517 |  | 9426 | 9381 |  |  | 15 |  | 4915 | 5025 |  | 5246 | 5356 |  |  |  | 41 |
| 42 | 8958 |  |  |  |  |  |  | 8634 |  | 38.85 |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 821 | 81 | 8124 | 80 |  | 7982 | 7935 | 7888 | 784 |  |  |  | 247 | 258 |  | 28 | 29 |  |  |  | 43 |
| 44 | 74 | 7431 |  | 73 |  |  |  |  |  |  |  |  | 625 | 63 |  |  | 672 | 684 |  |  | 44 |
| 45 | 6741 | 669 |  |  |  |  |  | 6394 | 6344 | 41．6295 | 16.9786 |  | －028 | 01 | 0271 | 0392 | 0513 | 063 | 0755 | 087 | 45 |
| 46 | 6001 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 47 | 526 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 | 452 | 44 | 4418 | 4365 | 4312 |  | 4207 | 41 | 410 | 44.40 | 18 |  |  | 1493 |  |  |  |  |  |  | 48 |
| 49 | 378 |  |  |  |  |  |  |  | 335 |  | 18.4 |  | 514 | 527 | 54 | 553 | 567 | 580 |  |  | 49 |
| 50 | 304 | 29 | 2935 | 288 | 2825 | 27 | 27 | 2660 | 260 | 46 | $18 \cdot 865$ | 878 | 892 | 905 | 919 | 932 | 945 |  | 97 | 986 | 50 |
| 51 | 2306 | 225 |  | 2138 |  | 2026 |  |  |  | $47 \cdot 180$ | 19 |  |  |  |  |  |  |  |  |  |  |
| 52 | 156 |  | 1453 | 1396 |  |  |  |  |  | $48 \cdot 105$ |  |  |  |  |  |  | 703 |  |  |  | 52 |
| 53 | 082 |  |  | 0653 |  |  |  | 042 |  |  | 19 |  | 02 | 03 |  |  | 08 | 09 |  |  | 53 |
|  | 008 |  | 9970 |  |  |  |  |  | 961 |  | $20 \cdot 37$ |  | 4034 | 417 |  | 44 | 461 | 476 |  | 505 | 54 |
| 55 | 935 | 928 | 922 | 9168 | 9108 | 904 |  | 8926 | 886 | $50 \cdot 880$ | 20.7516 |  |  | 7961 |  | 825 | 340 | 55 |  |  | 55 |
| 56 | 861 | 854 | 848 | 8426 | 836 | 830 |  |  |  |  | $21 \cdot 12$ |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 787 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 713 |  | 7005 | 694 |  |  |  |  | 6622 | 53.655 |  |  | 9 |  |  |  |  |  |  |  |  |
| 59 | 639 |  |  |  |  | 60 |  | 59 |  |  |  |  | 29 |  |  | 34 | 35 | 372 |  |  | 59 |
| 60 | 5654 | 5588 | 5522 | 5456 | 5390 | 532 | 5258 | 5192 |  | $55 \cdot 50$ | 22 | 65 | 670 |  | 702 | 718 | 735 | 75 | 767 | 78 | 60 |
| 61 | 4915 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4176 | 41 | 4040 | 3972 | 39 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 343 |  |  | 3229 | 3160 |  |  |  | 288 | 58.281 | 23 |  | 804 | 82 |  |  | 87 | 88 |  |  |  |
| 64 | 269 |  |  |  |  |  |  |  |  |  |  |  | 181 |  |  |  | 250 |  |  |  |  |
| 65 | 195 | 188 | 1816 | 174 | 167 |  | 153 |  |  |  |  |  | 559 |  |  |  | 629 |  |  |  | 65 |
| 66 | 122 |  |  | 1002 |  |  |  |  |  |  |  |  |  |  |  |  | ． 08 |  |  |  | 66 |
|  | 020 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 69 | 974 | 967 | 9592 | 9517 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 69 |  |  |  | 8775 |  |  |  | 8471 | 83 | 63＇831 | 26.03 | 05 | 071 |  |  |  | 145 | 163 |  | 20 |  |
| 70 | 826 | 86 | 8109 | 8032 |  |  |  | 7724 |  | 64．7570 | 26.41 | 4300 | 448 | 4677 |  | 5054 | 524 | 543 | 5619 | 5808 | 70 |
| 71 | 75 | 7446 |  | 7290 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 67 | 67 | 6627 | 654 | 6468 | 6389 | 63 | 6230 | 6151 | $66 \cdot 60$ | 27 | 18 | 204 | 22 | 24 | 26 | 282 |  |  |  | 72 |
| 73 |  |  |  |  |  |  | 5564 | 5484 | 5403 | 67－532 | 27－54 | 56 | 5824 | 60 | 62 | 64 | 661 | 6807 |  |  |  |
| 74 | 530 | 5226 | 5144 | 5063 | 4981 | 4900 | 4818 | 4737 |  |  |  |  |  |  |  |  | 仡 |  |  | 㖪 |  |
| 75 | 4568 |  | 4403 | 4320 | 4238 | 415 | 4073 | 399 | 390 | $69 \cdot 382$ | 28.2977 | 3179 | 338 | 358 | 378 | 3986 | 418 | 439 | 459 | 479 | 75 |
| 76 | 308 |  |  | 35 | 3494 | 3411 | 332 | 3243 | 315 | $70 \cdot 307$ | $28^{67}$ | 695 | 715 | 736 |  | 77 | 7978 | 818 | 8387 |  | 76 |
| 78 | 308 | 3005 |  | 20 |  |  |  | 2496 | 2411 | 1.232 |  |  | 093 | 114 | 538 | 559 | 176 | 197 | 汭 | 矿 |  |
| 78 | 235 | 226 | 21 | 209 | 200 | 1922 | 1836 | 1750 | 1664 | $72 \cdot 157$ | 29 | 4506 | 4716 | 4926 | 513 | 534 | 555 | 576 | 597 |  |  |
| 79 | 161 |  |  | 135 |  |  | 109 | 1003 | 0916 | 73.082 | 29.8 | 281 | 849 | 870 | 89 | 913 | 934 | 955 | 977 | 998 | 79 |
| 80 | 0872 | 0784 | 0696 | 0608 | 0520 |  |  |  | 0168 |  | － | 2057 | 27 | 248 |  |  | 3134 |  | 3565 | 378 | 80 |
| 81 | 0133 | －044 | 9955 | 9866 | 9777 | 888 | － |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 939 | S 54 | － | 912 | 33 | 894 | 8853 | 8762 | 8672 | 75.858 | 30.93 | 960 | 982 | －050 | 02 | 0492 | 071 | 093 | 154 | 137 | 82 |
| 83 | 869 | 85 | 8473 | 8381 |  | 8199 |  | 276 | 7924 | 76.783 | 31.31 | 3384 | 360 | 383 | 40 | 427 | 450 | 47 | 4949 | 51 |  |
| 84 | 7916 | 7824 | 7731 | 7639 | 7547 | 745 | 7361 | 7269 | 7176 | $77 \cdot 7083$ |  |  |  |  |  | 876 |  |  |  |  | 84 |
| 85 | 71 |  |  | 6897 | 6803 |  | 6616 | 726 | 7 | 78.6334 | 32．0707 | 0936 | 116 | 139 | 162 | 185 | s20 | 8， |  | 276 | 85 |
| 86 | 6438 | 6343 | 529 |  |  |  |  |  |  | 5585 | 32•44 | 4711 | 4943 | 517 | 54 | 563 | 586 | 610 | 6332 | 656 |  |
| 87 | 5698 | 5603 | 550 | 5412 | 5316 | 5220 | 5124 | 28 | 432 | 483 |  |  | 8721 | 8956 | 54 | 942 | 965 | 989 | －127 | 036 |  |
| 88 | 4959 | 4863 |  | 4 | 4573 | 4476 | 4379 | 4282 | 4185 | 81－4087 | 33．202 | 2263 | 2500 | 2737 | 2974 | 3211 | 3448 | 368 | 39 | 415 | 8 |
|  | 4220 | 4123 | 402 | 392 |  | 371 | 3633 | 3535 | 3437 | 82．3338 | 33．57 | 6039 | 6278 | 6518 | 6758 | 699 | 7237 | 747 | 771 | 795 | 89 |
| 90 | 34 | 3382 | 3284 | 3185 | 3086 | 2986 | 2887 | 2788 | 2689 | 83.2589 | 33.957 |  | 625 |  |  | 078 | 102 | 啢 |  |  | 90 |
| 91 | 2742 | 264 | 2542 | 2442 | 42 | 2242 | 2142 | 2041 | 1941 | 84 | 34 |  | 矿 |  |  | 45 | 815 | 506 |  |  |  |
| 92 | 203 | 1902 | 1801 | 17 | 1599 | 149 | 396 | 1294 | 1193 | $85 \cdot 109$ | 34.711 | 7366 | 7614 | 786 | 81 | 835 | 860 | 885 | ， | 93 | 92 |
| 93 | 126 | 1162 | 1060 | 0957 | 0855 | 0753 | 0650 | 0548 | 0445 | 342 | 888 | 1741 | 1392 | 1642 | 1893 | 2143 | 2394 | 264 | 校 | 1 |  |
| 94 | 525 | －48 | 518 | 0275 | 2 | 208 | ， | 80 | 9697 | 86.95 | $35 \cdot 4664$ | 4917 | 5170 | 54 | 56 | 5930 | 6183 | 643 | 66 |  | 94 |
| 95 | 978 | 96 | 957 | 9473 |  |  | 9159 | 9054 | 8949 | 884 | 35.8437 | 693 | 8949 | 920 | 94 | 971 | 997 | 228 | 0483 | 07 | 95 |
| 96 | 90 | 89 | 8836 | 30 | 8625 | 8519 | 8413 | 7560 | 8201 |  |  |  |  |  |  |  |  |  |  |  |  |
| 97 | 8307 | 820 | 839 | 7988 |  | 7774 | 7667 | 7560 | 7453 | $89 \cdot 7346$ | 36．5983 | 6244 | 6506 | 6767 | 702 | 728 | 7550 | 781 | 87 | 833 |  |
| 98 | 756 | 746 | 73 |  | 63 | 7030 | ， | 6814 | 5706 | $90 \cdot 6597$ | 36.9756 | －020 | 0284 | 0548 |  | 1076 | 1339 | 1603 | 1867 |  |  |
| 99 | 6829 | 6721 | 6512 | 03 | 6394 | 6285 | 61 | 6067 | 5958 | 91.5848 | $37 \cdot 352$ | 379 | 4062 | 432 | 459 | 4862 | 5129 | 5395 | 5662 |  | 99 |
| 100 | 6090 | 5981 |  | 61 | $\frac{5651}{46^{\prime}}$ | 5541 | 5430 | 5320 | 5210 | 92.5099 | 37．7302 | 7571 | 7841 | 8110 | 8379 | 8649 | 8918 | 9187 | 9456 | 9725 | 100 |
|  |  |  |  |  | $46^{\prime}$ | $45^{\prime}$ | $44^{\prime}$ | $43^{\prime}$ | ＇ | $41^{\prime}$ | $50^{\prime}$ | $49^{\prime}$ | ${ }^{1}$ | 左 | $46^{\prime}$ | $45^{\prime}$ | 44 |  | ${ }^{1}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Cos | SINE． |  |  |  |  |  |

TKAVERSE TABLES.

| 2 | INE. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $22^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | $21^{\prime}$ | $22^{\prime}$ | 23 | $24^{\prime}$ | $25^{\prime}$ | 26 | 27 | $28^{\prime}$ | $29^{\prime}$ | $20^{\circ}$ | $21^{\prime}$ | $22^{\prime}$ | 23 | $24^{\prime}$ | \| 25 | $26^{\prime}$ |  | $28^{\prime}$ |  |  |
|  | 925 | 924 | 924 | 92 | 9245 | 9244 | 924 | 9242 | 92 | 9240 | 3800 | 3803 | 3805 | 3808 | 3811 | 3813 | 3816 | 3819 | 3821 | 24 |  |
|  | 8500 | 849 | 849 | 8493 | 8491 | 8489 | 8486 | 84 | 8482 | 1.8480 | 760 | 760 | 7611 | 16 | 76 | 7627 | 7632 |  | 7643 | 7648 |  |
|  | 7750 | 7746 | 7743 | 7740 | 7736 | 7733 | 7730 | 77 | 7723 | $2 \cdot 7720$ | 140 | 140 | 14 | 24 | 1432 | 1440 | 1448 | 56 | 1464 | 1472 |  |
|  | 7000 | 6995 | 6991 | 6986 | 6982 | 6977 | 6973 | 696 | 6964 | 3.6960 | 15200 | 5211 | 5221 | 523 | 5243 | 5254 | 526 | 527 | 5286 | 529 |  |
| 5 | 6249 | 6244 | 6238 | 33 | 6227 | 6222 | 16 | 6211 | 62 | $4 \cdot 6200$ | . 9000 | 9013 | 9027 | 904 | 9054 | 9067 | 908 | 9094 | 9107 | 9121 |  |
| 6 | 5499 | 5493 | 5486 | 5479 | \|5473 | 5466 | 5459 | 5453 | 5446 | 5.5439 | $2 \cdot 2800$ | 2816 | 2832 | 2848 | 2864 | 2880 | 2896 | 2913 | 2929 | 294 |  |
|  | 4749 | 4741 | 4734 | 4726 | 4718 | 4710 | 4703 | 4695 | 4687 | $6 \cdot 4679$ | 2.6600 | 6618 | 6637 | 6656 | 6675 | 6694 | 6713 | 6731 | 6750 | 6769 |  |
|  | 399 | 3990 | 3981 | 3973 | 3964 | 3955 | 3946 | 3937 | 3928 | 7-3919 | 3.0400 | 0421 | 0443 | 0464 | 0486 | 0507 | 0529 | 055 | 0572 | 0593 |  |
|  | 3249 | 3239 | 3229 | 3219 | 3209 | 3199 | 3189 | 3179 | 3169 | 8.3159 | 3.4199 | 4224 | 4248 | 4272 | 4296 | 4321 | 4345 | 436 | 4393 | 4417 |  |
| 10 | 2499 | 2488 | 2477 | 2466 | 2455 | 2444 | 2432 | 2421 | 241 | 9.2399 | .79 | 8026 | 8053 | 808 | 8107 | 8134 | 816 | 818 | 821 | 8241 | 10 |
| 11 | 1749 | 1737 | 172 | 1712 | 17 | 1688 | 1676 | 1663 | 16 | 10.163 | $4 \cdot 1799$ | 18 | 1859 | 1888 | , | 1947 | 1977 | 2006 | 2036 | 2066 | 11 |
| 12 | 0999 | 0985 | 097 | 095 | 0946 | 0932 | 0919 | 0906 | 0892 | 11.0879 | 4.5599 | 5632 | 5664 | 569 | 5728 | 5761 | 5793 | 5825 | 5858 | 5890 | 12 |
| 13 | 0249 | 0234 | 0220 | 0205 | 0191 | 0177 | 0162 | 0148 | 0133 | 12.0119 | 4.9399 | 9434 | 9469 | 9504 | 9539 | 9574 | 9609 | 9644 | 9679 | 9714 | 13 |
| 14 | 9498 | 9483 | 9467 | 9452 | 9436 | 942 | 405 | 9390 | 937 | 12.9359 | 5.319 | 3237 | 3275 | 331 | 3350 | 3388 | 3425 | 346 | 3500 | 353 | 14 |
| 15 | 8748 | 8732 | 8715 | 8699 | 8682 | 8665 | 649 | 8632 | 8615 | 13.8599 | 5.6999 | 7040 | 7080 | 712 | 7161 | 7201 | 7241 | 7282 | 7322 | 7362 | 15 |
| 16 | 7998 | 7981 | 7963 | 7945 | 7927 | 79 | 7892 | 7874 | 7856 | 147839 | . 0799 | 0842 | 0885 | 092 | 097 | 1014 | 1057 | 1100 | 1143 | 1186 | 16 |
| 17 | 7248 | 7229 | 7210 | 7192 | 7173 | 7154 | 7135 | 7116 | 7097 | 15.7078 | $6 \cdot 4599$ | 4645 | 4691 | 4736 | 4782 | 4828 | 4873 | 4919 | 4965 | 5010 | 17 |
| 18 | 6498 | 6478 | 6458 | 6438 | 6418 | 6398 | 6378 | 6358 | 6338 | 16.6318 | 6.8399 | 8447 | 8496 | 854 | 8593 | 8641 | 8689 | 873 | 8786 | 883 | 18 |
| 19 | 5748 | 5727 | 5706 | 5685 | 5664 | 5643 | 5622 | 5600 | 5579 | $17 \cdot 5558$ | 7-2199 | 2250 | 2301 | 2352 | 2403 | 2454 | 2506 | 255 | 2608 | 265 | 19 |
| 20 | 49 | 4976 | 4954 | 4931 | 4909 | 4887 | 865 | 4843 | 4820 | 18.4798 | $7 \cdot 5999$ | 053 | 6106 | 616 | 6214 | 6268 | 632 | 637 | 64 | 648 | 20 |
| 21 | 4248 | 422 | 42 | 4178 | 415 | 413 | 4108 | 4085 | 40 | 19 | 7.9799 | 98 | 99 | 9968 | -025 | 0081 | 0138 | 0194 | 0251 | 0307 | 21 |
| 22 | 3498 | 3473 | 3449 | 3424 | 3400 | 3376 | 335 | 3327 | 330 | $20 \cdot 327$ | 8.3599 | 3658 | 3717 | 377 | 3835 | 3895 | 3954 | 40 | 40 | 4131 | 22 |
| 23 | 2747 | 2722 | 2697 | 2671 | 2646 | 2620 | 2595 | 2569 | 2543 | $21 \cdot 2518$ | 8.7399 | 7461 | 7522 | 758 | 7646 | 7708 | 7770 | 7832 | 789 | 7955 | 23 |
| 24 | 1997 | 1971 | 1944 | 1918 | 189 | 1864 | 183 | 1811 | 1784 | $22 \cdot 1758$ | 9.1199 | 1263 | 1328 | 1392 | 1457 | 1521 | 158 | 165 | 171 | 1780 | 24 |
| 25 | 1247 | 1220 | 1192 | 1164 | 1137 | 1109 | 281 | 1053 | 1026 | 23.0998 | 9•4999 | 5066 | 5133 | 5200 | 5268 | 5335 | 540 | 546 | 553 | 560 | 25 |
| 26 | 049 | 046 | 0440 | 0411 | 0382 | 03 | 0324 | 0295 | 0267 | 24.0238 | 9.8799 | 8868 | 8938 | 9008 | 9078 | 9148 | 921 | 9288 | 9358 | 9428 | 26 |
|  | 97 | 9717 | 968 | 9657 | 9627 | 9597 | 9568 | 9538 | 9508 | 24.9478 | 10.2598 | 2671 | 2744 | 2816 | 2889 | 2962 | 3034 | 310 | 317 | 3252 | 27 |
| 28 | 8997 | 896 | 8935 | 8904 | 8873 | 8842 | 8811 | 8780 | 8749 | 25.8717 | 10.63 | 6474 | 6549 | 662 | 6700 | 6775 | 685 | 692 | 700 | 707 | 28 |
| 29 | 8247 | 82 | 8183 | 8150 | 8118 | 86 | 8054 | 8022 | 7990 | $26 \cdot 7957$ | 11.0198 | 0276 | 0354 | 0432 | 0510 | 0588 | 066 | 074 | 082 | , | 29 |
| 30 | 7497 | 74 | 7430 | 7397 | 7364 | 7331 | 7297 | 7264 | 7231 | $27 \cdot 7197$ | 11.3998 | 4079 | 4160 | 4240 | 4321 | 4402 | 4482 | 456 | 464 | 4724 | 30 |
| 31 | 6747 | 6712 | 6678 | 6644 | 660 | 657 | 6541 | 6506 | 64 | 28.6437 | 117798 | 7882 | 7965 | 804 | 8132 | 82 | 829 | 8382 | 8465 |  | 31 |
| 32 | 599 | 596 | 592 | 5890 | 58 | 581 | 5784 | 5748 | 5713 | 29.5677 | 12.159 | 1684 | 1770 | 18 | 1943 | 2029 | 211 | 220 | 228 | 2373 | 32 |
| 33 | 5246 | 5210 | 5173 | 5137 | 5100 | 5064 | 5027 | 4990 | 4954 | 30.4917 | 12.5398 | 5487 | 5576 | 566 | 5753 | 5842 | 593 | 601 | 610 | 6197 | 33 |
| 34 | 4496 | 4459 | 4421 | 4383 | 4346 | 4308 | 4270 | 4232 | 4195 | 31.4157 | 12.9 | 9290 | 9381 | 9472 | 9564 | 9655 | 9747 | 9838 | 9930 | +02 | 34 |
| 35 | 3746 | 3707 | 3669 | 3630 | 3591 | 3552 | 3513 | 3475 | 3436 | 32.3397 | 13.2998 | 309 | 3186 | 3280 | 3375 | 3469 | 3563 | 3657 | 3751 | 3845 | 35 |
| 36 | 29 | 2956 | 2916 | 2876 | 2837 | 2797 | 2757 | 2717 | 2677 | 33.2637 | 13.6798 | 6895 | 6992 | 7089 | 7185 | 7282 | 7379 | 7476 | 7573 | 7669 | 36 |
| 37 | 224 | 22 | 2164 | 23 | 2082 | 2041 | 2000 | 1959 | 1918 | 34.1877 | 14.0598 | 0697 | 0797 | 089 | 0996 | 1096 | 119 | 129 | 1394 | 1493 | 37 |
| 38 | 1496 | 1454 | 1412 | 1370 | 1327 | 1285 | 1243 | 1201 | 1159 | 35.1117 | 14.4398 | 4500 | 460 | 470 | 4807 | 4909 | 501 | 511 | 5215 | 531 | 38 |
| 39 | 0746 | 0702 | 59 | 0616 | 0573 | 0530 | 0486 | 0443 | 0400 | 36.0356 | 14.8198 | 8303 | 8408 | 8513 | 8617 | 8722 | 8827 | 893 | 9037 | 9142 | 39 |
| 40 | 9996 | 95 | 990 | 986 | 9818 | 977 | 973 | 9685 | 9641 | 36.9596 | 15•1998 | 2105 | 2213 | 32 | 2428 | 2536 | 264 | 2751 | 285 | 2966 | 40 |
| 41 | 9245 | 9200 | 9155 | 9109 | 9064 | 9018 | 897 | 8927 | 8882 | 37 888 | 15.5798 | 5908 | 6018 | 612 | 6239 | 63 | 6459 | 657 |  |  | 41 |
| 42 | 8495 | 8449 | 8402 | 8356 | 830 | 8263 | 8216 | 8170 | 8123 | $38 \cdot 8076$ | 15.95 | 9711 | 9824 | 993 | -050 | 0163 | 027 | 038 | 050 | 0614 | 42 |
| 43 | 7745 | 7698 | 7650 | 7602 | 7555 | 7507 | 7459 | 7412 | 7364 | 39.7316 | 16.3398 | 3513 | 3629 | 37 | 3860 | 3976 | 409 | 420 | 432 | 4438 |  |
| 44 | 6995 | 6946 | 6898 | 6849 | 6800 | 675 | 6703 | 6654 | 6605 | 40.6 | $16 \cdot 7198$ | 7316 | 7434 | 7553 | 7671 | 7789 | 7908 | 8026 | 814 | 8262 | 44 |
| 45 | 6245 | 6195 | 6145 | 6096 | 6046 | 5996 | 5946 | 5896 | 5846 | 41.5796 | 17-0997 | 1119 | 1240 | 1361 | 1482 | 1603 | 1724 | 1845 | 1966 | 2087 | 45 |
| 46 | 54 | 54 | 53 | 42 | 291 | 5240 | 5189 | 38 | 5087 | 42.5036 | $17 \cdot 4797$ | 49 | 50 | 5169 | 5292 | 5416 | 5540 | 5663 | 7 | 591.1 | 46 |
| 47 | 4745 | 4693 | 46 | 4589 | 4537 | 4 | 4432 | 4380 | 4328 | $43 \times 42$ | $17 \cdot 85$ | 8724 | 8850 | 8977 | 9103 | 9229 | 935 | 948 | 9 | 5 | 47 |
| 48 | 3995 | 3942 | 388 | 3835 | 3782 | 372 | 3676 | 3622 | 3569 | 44.3516 | 18.2397 | 25 | 2656 | 2785 | 2914 | 3043 | 3172 | 330 | 3430 | 35 | 48 |
| 49 | 3245 | 3190 | 3136 | 3082 | 3028 | 2973 | 2919 | 2864 | 2810 | $45^{\circ} 2755$ | 18.6197 | 6329 | 6461 | 6593 | 6724 | 6856 | 6988 | 712 | 7251 | 7383 | 49 |
| 50 | 2494 | 2439 | 2384 | 28 | 73 | 2218 | 62 | 2107 | 051 | $46 \cdot 1995$ | 18.9997 | +132 | 266 | 040 | 053 | 067 | 0804 | 0939 | 1073 | 1207 | 50 |
| 51 | 1744 | 1688 | 16 | 1575 | 518 | 1462 | 1405 | 1349 | 1292 | $47 \cdot 123$ | 19.379 | 393 | 4072 | 42 | 4346 | 4483 | 4620 | 4757 | 4894 |  | 51 |
| 52 | 0994 | 093 | 087 | 0822 | 07 | 070 | 06 | 0591 | 0533 | 48.0475 | 19759 | 773 | 7877 | 801 | 8157 | 8296 | 843 | 857 | 8716 | 885 | 52 |
| 53 | 0244 | 0185 | 0127 | 0068 | -009 | 9951 | 9892 | 9833 | 9774 | 48.971 | 20.1397 | 1540 | 1682 | 1825 | 1967 | 2110 | 2252 | 239 | 25 | 268 | 53 |
| 54 | 9494 | 9434 | 9375 | 9315 | 9255 | 919 | 91 | 9075 | 9015 | $49 \cdot 8$ | 20:519 | 5342 | 5487 | 5633 | 5778 | 5923 | 6068 | 6214 | 6359 | 6504 | 54 |
| 55 | 8744 | 8683 | 8622 | 8561 | , 8500 | 8439 | 83 | 8317 | 8256 | 50.8195 | $20 \cdot 8997$ | 9145 | 9293 | 9441 | 9589 | 9737 | 9885 | ${ }^{+} \mathbf{0 3 2}$ | 0180 | 0328 | 55 |
| 56 | 79 | 793 | 7870 | 7808 | 7746 | 7684 | 76 | 559 | 7497 | 51 | $21 \cdot 2797$ | 29 | 3098 | 3249 | 33 | 3550 | 01 | 3851 | 40 | 4152 | 56 |
| 57 | 7244 | 7181 | 7118 | 054 | 6991 | 6928 | 6865 | 6801 | 6738 | 52.6 | 21.6597 | 6750 | 6903 | 705 | 7210 | 7363 | 7517 | 7670 | 7823 | 7976 |  |
| 58 | 6494 | 6429 | 6365 | 6301 | 6237 | 6172 | 6108 | 6044 | 5979 | 53.5915 | 22.0397 | 0553 | 0709 | 0865 | 102 | 1177 | 1333 | 148 | 1645 | 18 | 58 |
| 59 | 5743 | 5678 | 5613 | 5548 | 5482 | 5417 | 5351 | 5286 | 5220 | 54.5155 | 22.4197 | 4355 | 4514 | 4673 | 4832 | 4990 | 5149 | 530 | 5466 | 562 | 59 |
| 60 | 4993 | 4927 | 48 | 94 | 4728 | 466 | 4595 | 4528 | 461 | 55*4394 | 22.7997 | 8158 | 8319 | 848 | 864 | 8804 | 8965 | 912 | 928 | 9449 | 60 |
| 61 | 4243 | 4176 | 410 | 41 | 3973 | 39 | 38 | 3770 | 3702 | 56.3634 | 23•1797 | 1961 | 2125 | 2289 | 2453 | 2617 | 2781 | 2945 | 3109 | 327 | 61 |
| 62 | 3493 | 3424 | 335 | 3287 | 3219 | 3150 | 3081 | 3012 | 2943 | 57-2874 | 23.5597 | 5763 | 5930 | 609 | 6264 | 6430 | 6597 | 676 | 693 | 709 | 62 |
| 63 | 2743 | 2673 | 26 | 2534 | 2464 | 2394 | 2324 | 2254 | 2184 | 58.2114 | 23.9396 | 9566 | 9735 | 99 | +074 | 0244 | 0413 | 058 | 075 | 0921 | 63 |
| 64 | 1993 | 1922 | 1851 | 1780 | 1709 | 1638 | 1567 | 1496 | 1425 | $59 \cdot 1354$ | 24:3196 | 3369 | 3541 | 3713 | 388 | 4057 | 4229 | 4401 | 4573 | 4745 | 64 |
| 65 | 1243 | 1171 | 1099 | 1027 | 0955 | 0883 | 0811 | 0739 | 0666 | 60.0594 | $24 \cdot 6996$ | 7171 | 7346 | 7521 | 7696 | 7871 | 8045 | 8220 | 8395 | 8570 | 65 |
| 66 | 0493 | 0420 | 0347 | 0273 | 0200 | 012 | +054 | 981 | 990 | 60.983 | 25.0796 | 0974 | 1151 | 132 | 15 | 16 | 186 |  | 2216 |  | 66 |
| 67 | 9742 | 9668 | 9594 | 20 | 9446 | 9372 | 9297 | 9223 | 9148 | 61.9074 | $25 \cdot 459$ | 4776 | 4957 | 5137 | 53 | 5497 | 5677 | 585 | 6038 | 6218 | 67 |
| 68 | 8992 | 8917 | 8842 | 8767 | 8691 | 8616 | 8540 | 8465 | 8389 | $62 \cdot 8314$ | 25.8396 | 8579 | 8762 | 8945 | 91 | 9311 | 9494 | 967 | 9859 | +042 | 68 |
| 69 | 8242 |  |  | 析 | 7937 |  | 7784 | 7707 | 7630 | $63 \cdot 7554$ | 26 | 2382 | 2567 | 2753 | 238 | 3124 |  | 3 | \% |  | 69 |
| 70 | 7492 | 7415 | 7337 | 7260 | 182 | 7105 | 7027 | 6949 | 6871 | 64:6794 | $26 \cdot 599$ | 618 | 6373 | 656 | 674 | 6938 | 712 | 731 | 750 | 7690 | 70 |
| 71 | 67 | 6664 | 65 | 6506 | 6428 | 6349 | 6270 | 6191 | $61 / 2$ | $65 \cdot 6033$ | $26^{9796}$ | 9987 | +178 | 0369 | 0560 | 0751 | 0942 | 1133 | 1324 | 151 | 71 |
| 72 | 5992 | 5912 | 5833 | 5753 | 5673 | 5593 | 5513 | 5433 | 5353 | $66 \cdot 5273$ | 27.3596 | 3790 | 3983 | 4177 | 4371 | 4564 | 4758 | 495 | 514 | 5339 | 72 |
| 73 | 5242 | 5161 | 5080 | 4999 | 4919 | 4838 | 4757 | 4676 | 4594 | $67 \times 4513$ | $27 \cdot 7396$ | 7592 | 7789 | 7985 | 8181 | 8378 | 8574 | 8770 | 896 | 9163 | 73 |
| 74 | 4492 | 4410 | 4328 | 4246 | 4164 | 4082 | 4000 | 3918 | 3835 | $68 \cdot 3753$ | 28.1196 | 1395 | 1594 | 1793 | 1992 | 2191 | 2390 | 2589 | 2788 | 298 | 74 |
| 75 | 3742 | 365 | 3576 | 3493 | 3410 | 3326 | 3243 | 3160 | 3077 | 69-2993 | 28.4996 | 5198 | 5399 | 5601 | 5803 | 6004 | 20 | 40 | 6 | 681 | 75 |
| 76 | 2991 | 2907 | 2823 | 2739 | 2655 | 2571 | 2486 | 2402 | 2318 | 70.2233 | 28-8796 | 9000 | 9205 | 9409 | 9614 | 98 | ${ }^{1} 022$ | 022 | 043 |  | 76 |
| 77 | 2241 | 2156 | 2071 | 1986 | 1900 | 1815 | 1730 | 1644 | 1559 | 71.1473 | 29.2596 | 2803 | 3010 | 3217 | 3424 | 3631 | 3838 | 4045 | 4252 | 445 | 78 |
| 78 | 1491 | 1405 | 1319 | 1232 | 1146 | 1059 | 0973 | 0886 | 0800 | 72.0713 | 29.6396 | 6605 | 6815 | 7025 | 7235 | 7445 | 7654 | 7854 | 807 | 828 | 78 |
| 79 | 0741 | 0654 | 0566 | 0479 | 0391 | 0304 | 0216 | 0128 | +041 | 72.9953 | $30 \cdot 0196$ | 0408 | 0621 | 0833 | 1046 | 1258 | 1470 | 1683 | 189 |  | 79 |
| 80 | 9991 | 9903 | 9814 | 9725 | 9637 | 9548 | 9459 | 9370 | 9282 | 73.9193 | 30-3996 | 4211 | 4426 | 464 | 485 | 507 | 5287 | 550 | 5717 | 593 | 80 |
| 81 | 9241 | 9151 | 9062 | 8972 | 8882 | 8792 | 8703 | 8613 | 8523 | 74-8433 | 30.7795 | 8013 | 8231 | 8449 | 8667 | 8885 | 9103 | 9320 | 953 | 975 |  |
| 82 | 8491 | 8400 | 8309 | 8219 | 8128 | 8037 | 7946 | 7855 | 7764 | $75 \cdot 7672$ | 31.1595 | 1816 | 2037 | 225 | 2478 | 2698 | 2919 | 3139 | 336 | 358 | 82 |
| 83 | 7741 | 7649 | 7557 | 7465 | 7373 | 7281 | 7189 | 7097 | 7005 | 76.6912 | 31.5395 | 5619 | 5842 | 6065 | 6288 | 6512 | 6735 | 6958 | 718 | 7404 | 8 |
| 84 | 6991 | 6898 | 6805 | 6712 | 6619 | 6525 | 6432 | 6339 | 6246 | $77 \cdot 6152$ | 31.9195 | 9421 | 9647 | 9873 | +099 | 0325 | 0551 | 0777 | 700 | 1228 | 84 |
| 85 | 6240 | 6146 | 6052 | 5958 | 5864 | 5770 | 5676 | 5581 | 5487 | 78.5392 | 32.2995 | 3224 | 345 | 3681 | 3910 | 41 | 43 | 4595 | 4824 | 5052 | 85 |
| 86 | 5490 | 5395 | 5300 | 5205 | 5110 | 5014 | 4919 | 4823 | 4728 | 79.4632 | 32.6795 | 7027 | 7258 | 7489 | 7721 | 7952 | 8183 | 8414 | 864 |  | 86 |
| 87 | 4740 | 4644 | 4548 | 4451 | 4355 | 4259 | 4162 | 4065 | 3969 | 80.3872 | 33.0595 | 0829 | 1063 | 1297 | 1531 | 1765 | 1999 | 2233 | 246 | 2701 | 87 |
| 88 | 399 | 3893 | 3795 | 3698 | 3600 | 3503 | 3405 | 3308 | 3210 | 81.3112 | 33.4395 | 4632 | 4869 | 5105 | 5342 | 5579 | 5815 | 6052 | 628 | 65 | 8 |
| 89 | 3240 | 3142 | 203 | 2945 | 2846 | 2747 | 2649 | 2550 | 2451 | 82.2352 | 33.8195 | 8434 | 8674 | 8913 | 9153 | 9392 | 9631 | 9871 | +110 | 0349 | 89 |
| 90 | 2490 | 2390 | 2291 | 2191 | 2091 | 1992 | 1892 | 1792 | 1692 | $83 \cdot 1592$ | 34.1995 | 2237 | 2479 | 2721 | 2963 | 320 | 3447 | 368 | 393 | 4173 | 90 |
| 91 | 1740 | 163 | 1539 | 1438 | 1337 | 1236 | 1135 | 1034 | 0933 | 84.0832 | 34.5795 | 6040 | 6284 | 6529 | 6774 | 7019 | 7263 | 7508 | 7753 | 799 | 9 |
| 92 | 0990 | 0888 | 0786 | 0684 | 0582 | 0480 | 0378 | 0276 | 0174 | 85.0072 | 34.9595 | 9842 | -090 | 0337 | 0585 | 0832 | 1080 | 1327 | 157 | 182 | 92 |
| 93 | 024 | 013 | +034 | 9931 | 9828 | 9725 | 9622 | 9518 | 9415 | 85.9311 | 35.3395 | 3645 | 3895 | 4145 | 4395 | 4646 | 4896 | 5146 | 5396 | 56 | 93 |
| 94 | 948 | 9386 | 9282 | 9177 | 9073 | 8969 | 8865 | 8760 | 8656 | 86.8551 | $35 \cdot 7195$ | 7448 | 7700 | 7953 | 8206 | 8459 | 8712 | 8964 | 9217 | 947 | 94 |
| 95 | 8739 | 极 | 922 | 9121 | O19 | 21 | 8108 | 8002 | 7897 | 87.7791 | 36.0995 | 1250 | 1506 | 1761 | 2017 | 2272 | 2528 | 2783 | 3039 | 3294 |  |
| 96 | 7989 | 7883 | 777 | 7671 | 7564 | 7458 | 7351 | 7245 | 7138 | 88.7031 | 36.4795 | 5053 | 5311 | 5569 | \|5828 | 6086 | 6344 | 6602 | 6860 | 7118 | 96 |
| 97 | 7239 | 7132 | 7025 | 6917 | 6810 | 6702 | 6594 | 6487 | 6379 | 89.6271 | 36.8595 | 8855 | 9116 | 9377 | 9638 | 9899 | \$160 | 0421 | 0682 | 0942 | 98 |
| 98 | 6489 | 6381 | 6272 | 6164 | 6055 | 5946 | 5838 | 5729 | 5620 | $90 \cdot 5511$ | $37 \cdot 2395$ | 2658 | 2922. | 3185 | 3449 | 3713 | 3976 | 4239 | 4503 | 476 | 98 |
|  | 5739 | 5629 | 5520 | 5410 | 5301 | 5191 | 5081 | 4971 | 4861 | 91.4751 | 37•6194 | 6461 | 6727 | 6993 | 7260 | 7526 | 7792 | 8058 | 8324 | 859 | 99 |
| 100 | 4989 | 4878 | 4768 | 4657 | 4546 | 4435 | 4324 | 4213 | 4102 | 923991 | 37.9994 | +263 | 0532 | 0801 | 1070 | 1339 | 1608 | 1877 | 2146 | 2415 | 100 |
|  | $40^{\prime}$ | 39 | $38^{\prime \prime}$ | $37^{\prime}$ | $36^{\prime}$ | $35^{\prime}$ | $34^{\prime}$ | 33 | $32^{\prime}$ | 31 ${ }^{\prime}$ | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | $37^{\prime}$ | 36 | 35 | $34^{\prime}$ | $33^{\prime}$ |  | $31^{1}$ |  |
| 67 |  |  |  |  | SI |  |  |  |  |  |  |  |  |  | Co | E. |  |  |  |  | $67^{\circ}$ |

TRAVERSE TABLES．

| $22^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | SINE． |  |  |  |  |  |  |  |  |  | $22^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $31{ }^{\prime}$ | 31 | 32 | 32 | $34^{\prime}$ | 35 | $36^{\prime}$ | $37^{\prime}$ | $3{ }^{\prime}$ | $39^{\prime}$ | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | $34^{\prime}$ | 35＇ | $36^{\prime}$ | 37 | $38^{\prime \prime}$ | $39^{\prime}$ |  |
|  | 923 | 92 | 9237 | 92 | 9234 | 92 | 92 | 92 | 92 | 229 | 827 | 3830 | 3832 | 3835 | 3838 | 3840 | 3843 | 3846 | 3848 | 51 |  |
| 2 | 84 | 8475 | 8473 | 8471 | 8469 | 846 | 846 | 8462 | 8460 | $1 \cdot 8457$ | 654 | 7659 | 766 | 7670 | 7675 | 768 | 7686 | 7691 | 7697 | 22 | 2 |
|  | 7716 | 7713 | 7710 | 7706 | 7703 | 7700 | 7696 | 7693 | 7690 | $2 \cdot 7686$ | $1 \cdot 1481$ | 1489 | 1497 | 1505 | 1513 | 1521 | 1529 | 1537 | 1545 | 155 | 3 |
| 4 | 6955 | 6951 | 6946 | 6942 | 6937 | 6933 | 6928 | 6924 | 6919 | 3.6915 | 1.5307 | 5318 | 5329 | 5340 | 5350 | 5361 | 5372 | 5383 | 5393 | 540 |  |
| 5 | 6194 | 6188 | 6183 | 6177 | 6172 | 6166 | 6161 | 6155 | 6149 | 4：6144 | 19134 | 9148 | 916 | 917 | 9188 | 920 | 9215 | 9228 | 9242 | 9255 | 5 |
| 6 | 5433 | 5426 | 5419 | 5413 | 5406 | 5399 | 53 | 53 | 53 | 5.53 | 2.2961 | 2977 |  | 3009 | 3025 | 3042 | 3058 | 3074 | 3090 | 3106 | 6 |
| 7 | 4672 | 4664 | 4656 | 4648 | 4640 | 4633 | 4625 | 4617 | 4609 | 6.460 | 2.6788 | 6807 | 6825 | 6844 | 6863 | 6882 | 6901 | 6919 | 6938 | 695 |  |
| 8 | 3910 | 3901 | 389 | 3884 | 3875 | 3866 | 3857 | 3848 | 3839 | 7.383 | 3.0615 | 0636 | 0658 | 0679 | 0701 | 0722 | 0744 | 0765 | 0787 | 0808 | 8 |
| 9 | 3149 | 3139 | 3129 | 3119 | 3109 | 3099 | 3089 | 3079 | 3069 | $8 \cdot 3059$ | 3.4442 | 4466 | 4490 | 4514 | 4538 | 4562 | 4587 | 4611 | 4635 | 465 |  |
| 10 | 2388 | 2377 | 2366 | 2355 | 2343 | 2332 | 2321 | 2310 | 2299 | 9.2287 | $3 \cdot 8268$ | 8295 | 8322 | 8349 | 8376 | 8403 | 8430 | 8456 | 8483 | 851 | 0 |
| 11 | 1627 | 16 | 1602 | 1590 | 1578 | 15 | 15 | 154 | 1529 | 10.151 | 2095 | 2125 | 215 | 2184 | 2213 | 2243 | 2272 | 2302 | 2332 | 23 | 11 |
| 12 | 0866 | 0852 | 0839 | 0825 | 0812 | 0799 | 078 | 0772 | 0758 | 11.0745 | 5922 | 5954 | 5987 | 6019 | 6051 | 6083 | 6115 | 6148 | 6180 | 621 | 12 |
| 13 | 0104 | 0090 | 0075 | 006 | 0046 | 0032 | 0017 | ＋003 | 9988 | 11.9974 | 49749 | 9784 | 9819 | 9854 | 9889 | 9923 | 9958 | 9993 | 4028 | 006 | 13 |
| 14 | 9343 | 9328 | 9312 | 9296 | 9281 | 9265 | 924 | 9234 | 9218 | 12.9202 | 5.3576 | 3613 | 3651 | 3689 | 3726 | 3764 | 3801 | 3839 | 3877 | 391 | 14 |
| 15 | 8582 | 8565 | 8549 | 32 | 8515 | 8498 | 8482 | 8465 | 84818 | 13.8431 |  | 7443 | 7483 | 7523 | 756 | 760 | 764 | 7685 | 7725 | 7765 |  |
| 16 | 7821 | 7803 | 77 | 7767 | 7749 | 7732 | 771 | 76 | 76 | 14 | $6 \cdot 1229$ | 1272 | 1315 | 1358 | 14 | 144 | 1487 | 1530 | 373 | 1616 | 16 |
| 17 | 7060 | 7041 | 702 | 700 | 698 | 6965 | 69 | 69 | 69 | 15.6 | 50 | 5102 | 5148 | 5193 | 52 | 5285 | 5330 | 5376 | 5422 | 5467 | 17 |
| 18 | 6298 | 6278 | 6258 | 6238 | 6218 | 6198 | 6178 | 6158 | 6138 | 16.6117 | 8883 | 8931 | 898 | 9028 | 9076 | 9125 | 9173 | 9222 | 9270 | 931 | 18 |
| 19 | 5537 | 5516 | 5495 | 547 | 542 | 5431 | 5410 | 538 | 5367 | 17.53 | 7.27 | 2761 | 2812 | 2863 | 2914 | 2965 | 3016 | 3067 | 311 | 3169 | 19 |
| 20 | 4776 | 4754 | 4731 | 4709 | 4687 | 4664 | 4642 | 4620 | 4597 | 18.4575 | 7.6537 | 6590 | 664 | 6698 | 6752 | 6805 | 6859 | 6913 | 6966 | 702 | 20 |
| 21 | 4015 | 399 | 39 | 39 | 3921 | 3898 | 3874 | 38 | 3827 | 19 | 8.0364 | 0420 | 0476 | 053 | 0589 | 0646 | 070 | 0758 | 0815 | 0871 | 21 |
| 22 | 3253 | 3229 | 3204 | 3180 | 3155 | 3131 | 3106 | 3082 | 3057 | $20 \cdot 3032$ | 8.41 | 4249 | 430 | 4368 | 4427 | 448 | 4545 | 4604 | 4663 | 472 | 22 |
| 23 | 2492 | 2467 | 2441 | 2415 | 2390 | 2364 | 2338 | 2313 | 2287 | $21 \cdot 226$ | 8.8017 | 807 | 8141 | 8203 | 8264 | 832 | 8388 | 8450 | 8511 | 857 | 23 |
| 24 | 1731 | 1704 | 1678 | 1651 | 1624 | 1597 | 1570 | 1544 | 1517 | 22．1490 | $9 \cdot 1844$ | 1909 | 1973 | 2037 | 2102 | 216 | 2231 | 2295 | 236 | 242 | 24 |
| 25 | 097 | 0942 | 1 |  |  |  |  | 75 | 0747 | 23.0719 | 1 | 738 | 580 | 5872 | 5940 | 6007 | 607 | 61 | 520 |  | 25 |
| 26 | 0209 | 80 | 0151 | 01 | 009 | 0064 | 0035 | 1006 | 9976 | 23 | 9.9498 | 956 | 96 | 97 | 97 | 984 | 991 | 99 | 6 | 0126 | 26 |
| 27 | 9447 | 9417 | 9387 | 935 | 93 | 9297 | 92 | 92 | 92 | 24 | 10.33 | 339 | 34 | 35 | 3615 | 368 | 376 | 3832 | 5 | 3977 | 27 |
| 28 | 8686 | 8655 | 8624 | 8593 | 8561 | 8530 | 8499 | 8468 | 8436 | 25.8 | 10.7151 | 7227 | 7302 | 737 | 7452 | 7528 | 7603 | 7678 | 7753 | 782 | 28 |
| 29 | 7925 | 7893 | 7860 | 7828 | 7796 | 7763 | 7731 | 7699 | 7666 | 26. | 11.09 | 1056 | 113 | 12 | 1290 | 136 | 1446 | 1524 | 60 | 1679 | 29 |
| 30 | 7164 | 7130 | 7097 | 7064 | 7030 | 6997 | 6963 | 6930 | 6896 | 27.6862 | 11.4805 | 4886 | 4966 | 504 | 5127 | 520 | 528 | 53 | 5450 | 553 | 30 |
| 31 | 640 | 68 | 6334 | 6299 | 6264 | 6230 | 6195 | 6161 | 61 | $28 \cdot 6091$ | 11.8632 | 8715 | 8798 | 8882 | 8965 | 9048 | 9132 | 9215 | 9298 |  | 31 |
| 32 | 5641 | 5606 | 5570 | 5534 | 5499 | 5463 | 5427 | 5391 | 5356 | 29.53 | 12. | 254 | 263 | 27 | 2803 | 288 | 297 | 309 | 3146 | 3232 | 32 |
| 33 | 4880 | 4844 | 4807 | 4770 | 4733 | 4696 | 4659 | 4622 | 4586 | 30.45 | 12.6 | 637 | 6463 | 65 | 6640 | 67 | 68 | 69 | 6995 | 708 | 33 |
| 34 | 4119 | 4081 | 4043 | 4005 | 3967 | 3929 | 3891 | 3853 | 3815 | 31．3777 | 13.0112 | 0204 | 0295 | 0386 | 0478 | 0569 | 066 | 0752 | 0843 | 093 | 34 |
| 35 | 3358 | 3319 | 3280 |  | 3202 | 3163 | 3124 | 3084 | 3045 | 32．300 | $13 \cdot 39$ | 4033 | 412 | 4221 | 4315 | 440 | 450 | 459 | 4691 | 478 | 35 |
| 36 | 2597 | 2557 | 2516 | 247 | 2436 | 2396 | 2356 | 231 | 22 | 33．2235 | 13．7766 | 786 | 79 | 80 | 8153 | 825 | 83 | 84 | 8540 | 863 | 36 |
| 37 | 1835 | 1794 | 1753 | 1712 | 1670 | 1629 | 1588 | 1546 | 150 | 34．1464 | 14.1 | 169 | 179 | 18 | 19 | 209 | 21 | 22 | 2388 | 248 | 37 |
| 38 | 1074 | 1032 | 0990 | 0947 | 0905 | 08 | 820 | 0777 | 0735 | 35．0692 | 14.5420 | 552 | 5624 | 57 | 5828 | 5930 | 603 | 61 | 6236 | 633 | 38 |
| 39 | $03 / 3$ | 0270 | 0226 | 0183 | 0139 | 00 | 522 | ＋008 | 9965 | 35．9921 | 14.9247 | 935 | 9456 | 95 | 9666 | 9770 | 987 | 99 | 85 | 018 | 39 |
| 40 | 9552 | 07 | 9463 | 9418 | 9373 | 9329 | 9284 | 9239 | 9195 | 36.9150 | $15 \cdot 3073$ | 3181 | 328 | 339 | 3503 | 3611 | 371 | 3826 | 3933 | 404 | 40 |
| 41 | 8791 | 8745 | 8699 | 8654 | 8608 | 8562 | 8516 | 8470 | 8424 | $37 \cdot 8379$ | 15 | 7010 | 7121 | 7231 | 7341 | 7451 | 7561 | 7671 | 7781 |  | 41 |
| 42 | 8029 | 7983 | 7936 | 7889 | 7842 | 7795 | 7748 | 7701 | 7654 | 38.760 | 16.0727 | 0840 | 0953 | 1066 | 1178 | 1291 | 1404 | 15 | 163 | 17 | 42 |
| 43 | 7268 | 7220 | 7172 | 7124 | 707 | 702 | 6980 | 6932 | 6884 | 39．6836 | 16.45 | 466 | 478 | 4900 | 5016 | 5132 | 524 | 53 | 547 | 55 | 43 |
| 44 | 6507 | 6458 | 6409 | 6360 | 6311 | 6262 | 212 | 6163 | 6114 | 40．6065 | 16.83 | 84 | 861 | 873 | 8854 | 897 | 909 | 9208 | 32 | 94 | 44 |
| 45 | 5746 | 5696 | 5646 | 5595 | 5545 | 5495 | 145 | 5394 | 5344 | 41.5294 | 17.22 | 232 | 244 | 257 | 269 | 281 | 293 | 仡 | 317 | 329 | 45 |
| 46 | 4985 | 4933 | 4882 | 483 | 477 | 4728 | 467 | 462 | 4574 | 42．4522 | $17 \cdot 6034$ | 615 | 628 | 64 | 652 | 665 | 677 | 6899 | 702 | 714 | 46 |
| 47 | 4223 | 4171 | 4119 | 4066 | 4014 | 3961 | 3909 | 3856 | 3804 | $43 \cdot 375$ | 17.9861 | 998 | ＋11 | 02 | 036 | 049 | 0619 | 07 | 087 | 099 | 47 |
| 48 | 3462 | 3409 | 3355 | 3302 | 3248 | 3195 | 3141 | 3087 | 3034 | 44＇2980 | 18.3688 | 3817 | 3946 | 4075 | 420 | 4333 | 446 | 459 | 4720 | 484 | 48 |
| 49 | 2701 | 2646 | 2592 | 2537 | 2482 | 2428 | 2373 | 2318 | 2263 | 45．2209 | 18. | 764 | 7778 | 79 | 804 | 8173 | 830 | 8436 | 8568 |  | 49 |
| 50 | 19 | 1884 | 1828 | 1773 | 1717 | 1661 | 1605 | 1549 | 93 | $46^{\circ} 1437$ | $19 \cdot 1342$ | 147 | 1610 | 174 | 1879 | 2013 | 214 | 2282 | 241 | 255 | 50 |
| 51 | 117 | 1122 | 1065 | 10 | 09 | 0894 | 0837 | 1078 | 0723 | 47.066 | 19 | 530 | 544 | 5580 | 57 | 5854 | 5991 |  | 6265 |  |  |
| 52 | 0417 | 0359 | 0301 | 0244 | 0185 | 0127 | 0069 | 4011 | 9953 | 47.989 | 19.8995 | 9135 | 9275 | 9415 | 9554 | 9694 | 9834 | 9973 | 1113 | 025 | 52 |
| 53 | 9656 | 9597 | 9538 | 9479 | 9420 | 9361 | 9301 | 9242 | 9183 | 48.9123 | 20＇2822 | 296 | 3107 | 3249 | 3392 | 3534 | 3677 | 3819 | 3961 | 410 | 53 |
| 54 | 8895 | 8835 | 8775 | 8714 | 8654 | 8594 | 8534 | 8473 | 8413 | 49.8352 | 20.664 | 6794 | 6939 | 7084 | 7229 | 737 | 7519 | 7665 | 780 |  | 54 |
| 55 | 8134 | 8073 | 8011 | 7950 | 7888 | 7827 | 7766 | 7704 | 7643 | 50.7581 | $21 \cdot 0476$ | 0624 | 0771 | 0919 | 1067 | 1215 | 136 | 1510 | 165 | 80 | 55 |
| 56 | 7373 | 10 | 7248 | 71 | 7123 | 7060 | 6998 | 6935 | 6872 | 51.6810 | 21／4303 | 4453 | 4604 | 4754 | 4905 | 505 | 5205 | 5356 | 5506 | 565 | 56 |
| 57 | 矿 | 6548 | 84 | 6421 | 6357 | 6294 | 6230 | 6166 | 6102 | $52 \cdot 6038$ | 21.8130 | 8283 | 8436 | 8589 | 8742 | 889 | 9048 | 9201 | 9354 |  | 57 |
| 58 | 5850 | 5786 | 5721 | 5656 | 5591 | 5527 | 5462 | 5397 | 5332 | 53.5267 | $22^{1} 1956$ | 2112 | 226 | 2424 | 2580 | 2736 | 2891 | 3047 | 320 | 33 | 58 |
| 59 | 5089 | 5023 | 4957 | 4892 | 4826 | 4760 | 4694 | 4628 | 4562 | 54．4496 | $22 \cdot 5783$ | 5942 | 6100 | 6259 | 6417 | 6576 | 6734 | 6893 | 7051 |  | 59 |
| 60 | 4328 | 4261 | 4194 | 4127 | 4060 | 3993 | 926 | 3859 | 3792 | 55.3725 | 22.9610 | 9771 | 9933 | ＋094 | 0255 | 0416 | 0577 | 0738 | 089 | 106 | 60 |
| 61 | 3566 | 3499 | 343 | 3363 | 3294 | 26 | 3158 | 3090 | 3022 | 56．2953 | 23.343 | 3601 |  |  |  | 4256 |  |  |  |  | 61 |
| 62 | 2805 | 2736 | 2667 | 2598 | 2529 | 2460 | 2390 | 2321 | 2252 | 57．2182 | $23 \cdot 7264$ | 7430 | 759 | 77 | 7930 | 809 | 8263 | 8430 | 859 | 876 | 62 |
| 63 | 204 | 19 | 1904 | 1833 | 1763 | 1693 | 1622 | 1552 | 1481 | $58 \cdot 1411$ | 24．109 | 1260 | 1429 | 1598 | 1768 | 1937 | 2106 | 2275 | 24 | 26 | 63 |
| 64 | 1283 | 1212 | 1140 | 1069 | 0998 | 0926 | 0855 | 0783 | 0711 | 59.0640 | 24．491 | 5089 | 5261 | 5433 | 5605 | 5777 | 5949 | 6121 | 629 | 646 | 6 |
| 65 | 0522 | 0449 | 0377 | 030 | 0232 | 0159 | 0087 | ＋014 | 9941 | 59.986 | 24.874 | 891 |  | 926 | 9443 | 96 | 979 | 996 | 141 | 031 | 65 |
| 66 | 9760 | 9687 | 9613 | 9540 | 9466 | 9393 | 9319 | 9245 | 9171 | 60．9097 | $25^{2571}$ | 2748 | 2926 | 3103 | 3280 | 3458 | 3635 | 3812 | 3989 | 416 | 67 |
| 67 | 899 | 89 | 8850 | 8775 |  | 26 | 8551 | 8476 | 8401 | 61.8326 | $25 \cdot 639$ | 6578 | 6758 | 6938 | 7118 | 7298 | 7478 | 150 | 仡 |  | 67 |
| 68 | 8238 | 81 | 8087 | 8011 | 7935 | 7859 | 7783 | 7707 | 7631 | 62.7555 | 26.022 | 0407 | 0590 | 0773 | 0956 | 1138 | 1321 | 1503 | 1686 | 186 | 68 |
| 69 | 7477 |  | 7323 |  |  | 7092 | 7015 | 6938 | 6861 | $63 \cdot 6783$ | $26^{\prime 2} 052$ | 4237 | 4422 | 4608 | 4793 | 4978 | 5164 | 5349 | 553 | 572 | 69 |
| 70 | 6716 | 6638 | 6560 | 6482 | 6404 | 6325 | 6247 | 6169 | 6091 | 64．6012 | 26.7878 | 8067 | 8255 | 844 | 863 | 8819 | 9007 | 919 |  | 957 | 70 |
| 71 | 5954 | 5875 | 5796 | 5717 | 5638 | 5559 | 5479 | 5400 | 5320 | $65 \cdot 5241$ | $27 \cdot 1705$ | 1896 | 2087 | 2278 | 2468 | 2659 | 28 | 位 | 23 |  | 71 |
| 72 | 5193 | 5113 | 5033 | 4953 | 4872 | 4792 | 4711 | 4631 | 4550 | 66.4470 | 27－5532 | 5726 | 5919 | 6112 | 6306 | 6499 | 6693 | 6886 | 7079 | 727 | 72 |
| 73 | 4432 | 4351 | 4269 | 4188 | 4107 | 4025 | 3943 | 3862 | 3780 | 67•3698 | $27 \cdot 9359$ | 9555 | 9751 | 9947 | ＋143 | 0340 | 0536 | 0732 | 092 | 112 | 73 |
| 74 | 3671 | 3588 | 3506 | 3423 | 3341 | 3258 | 3176 | 3093 | 3010 | $68^{2927}$ | 28.3186 | 3385 | 3583 | 3782 | 3981 | 4180 | 4379 | 4577 | 4776 | 497 | 74 |
| 75 | 2910 | 2826 | 2743 | 2659 | 2575 | 2492 | 2408 | 2324 | 2240 | 69．2156 | $28 \cdot 7013$ | 721 | 741 | 7617 | 781 | 8020 | 822 | 8423 | 862 | 882 | 75 |
| 76 | 2148 | 2064 | 1979 | 1894 | 1810 | 1725 | 1640 | 1555 | 1470 | 70＇1385 | $29^{\circ} 0839$ | 1044 | 1248 | 1452 | 1656 | 1860 | 2064 | 2269 | 2473 | 26 | 76 |
| 77 | 1387 | 1302 | 1216 | 1130 | 1044 | 0958 | 0872 | 0786 | 0700 | 71.0613 | 29＊4666 | 4873 | 5080 | 5287 | 5494 | 5701 | 5907 | 6114 | 632 |  | 77 |
| 78 | 0626 | 0539 | 0452 | 0365 | 0278 | 0191 | 0104 | －017 | 9929 | 71.9842 | 29－8493 | 8703 | 8912 | 9122 | 9331 | 9541 | 9750 | 9960 | －169 | 037 | 78 |
| 79 | 9865 | 9777 | 9689 | 9601 | 9513 | 424 | 336 | 9248 | 9159 | 72.9071 | 30．2320 | 2532 | 2745 | 2957 | 3169 | 3381 | 3593 | 3805 | 4018 | 4230 | 79 |
| 80 | 910 | 9015 | 8925 | 8836 | 8747 | 8658 | 568 | 8479 | 8389 | 73.8300 | $30 \cdot 6147$ | 6362 | 657 | 6792 | 7007 | 722 | 743 | 765 | 786 | 808 | 80 |
| 81 | 8342 | 8252 | 8152 | ${ }^{8072}$ | 7981 | 7891 | 7800 | 7710 | 7619 | 74.7528 | 30＇9974 | ＋191 | 0409 | 0626 | 0844 | 1062 | 1279 | 1497 | 1714 | 19 | 81 |
| 82 | 75820 | 7490 | 7398 | 7307 | 7216 | 7124 | 7032 | 6941 | 6849 | $75 \cdot 6757$ | 31．3800 | 4021 | 4241 | 4461 | 4682 | 4902 | 5122 | 5342 | 5563 | 57 | 82 |
| 83 | 6820 | 6728 | 6635 | 6543 | 6450 | 6357 | 6264 | 6172 | 6079 | 76.5986 | 31.7627 | 7850 | 8073 | 8296 | 8519 | 8742 | 8965 | 188 | 941 | 矿 | 83 |
| 84 | 6059 | 5965 | 5872 | 5778 | 5684 | 5590 | 5497 | 5403 | 5309 | 77.5215 | $32 \cdot 1454$ | 1680 | 1906 | 2131 | 2357 | 2583 | 2808 | 3034 | 3259 | 348 | 84 |
| 85 | 5298 | 5203 | 5108 | 5013 | 4919 | 4824 | 仿 | 463 | 4539 | 78.4443 | 32.5281 | 550 | 573 | 5966 | 6194 | 642 | 665 | 687 | 7 | 733 | 85 |
| 86 | 4536 | 4441 | 4345 | 4249 | 4153 | 4057 | 3961 | 3865 | 3768 | 79.3672 | 32.9108 | 9339 | 9570 | 9801 | ． 032 | 0263 | 0494 | 0725 | 995 |  | 87 |
| 87 | 3775 | 3678 | 3581 | 3484 | 3387 | 3290 | 3193 | 3096 | 2998 | 80．2901 | $33 \cdot 2935$ | 3168 | 3402 | 3636 | 3870 | 4103 | 4337 | 4571 | 4804 |  | 87 |
| 88 | 3014 | 2916 | 2818 | 2720 | 2622 | 2523 | 2425 | 2327 | 2228 | $81 \cdot 2130$ | 33.6761 | 699 | 7234 | 7471 | 7707 | 794 | 8180 | 8416 | 865 | 88 | 88 |
|  | 2253 | 2154 | 2054 | 1955 | 1856 | 1757 | 1657 | 1558 | 1458 | $82 \cdot 1358$ | 34.0588 | 0827 | 1067 | 1306 | 1545 | 178 | 202 | 2262 | 250 | 2 | 89 |
| 90 | 1492 | 1391 | 1291 | 1191 | 1090 | 0950 | 0889 | 0789 | 0688 | 83.0587 | 34：4415 | 4657 | 4899 | 5141 | 5382 | 562 | 586 | 6108 | 6349 | 659 | 90 |
| 91 | 0730 | 0629 | 0528 | 0426 | 0325 | 0223 | 0121 | 1020 | 9918 | 83.9816 | $34 \cdot 8242$ | 8487 | 873 | 8975 | 9220 | 946 | 9709 | 9953 | ＋197 | 04 | 91 |
| 92 | 9969 | 9867 | 9764 | 9662 | 9599 | 9456 | 9353 | 9251 | 9148 | $84 \cdot 9045$ | 35.2069 | 2316 | 2563 | 2810 | 3058 | 3305 | 3552 | 3799 | 4046 | 42 | 92 |
| 93 | 9208 | 9104 | 9001 | 8897 | 8793 | 8689 | 8585 | 8482 | 8377 | 85＊8273 | 35.5896 | 6146 | 6395 | 6645 | 6895 | 7145 | 7395 | 7644 | 7894 | 81 | 93 |
| 95 | 8447 | 8342 | 8237 | 8132 | 8028 | 7923 | 7818 | 7712 | 7607 | 86.7502 | 35.9722 | 997 | ＋228 | 0480 | 0733 | 0985 | 1238 | 1490 | 1742 | 199 | 碞 |
| 95 | 7686 | 7580 | 7474 | 7368 | 7262 | 7156 | 7050 | 6943 | 7637 | $87 \cdot 6731$ | 36.3549 | 3805 | 406 | 4315 | 457 | 482 | 1 | ， | 172 | 5846 | 9 |
| 96 | 6924 | ${ }^{6817}$ | 6710 | 6603 5839 | 6496 | 6389 | 6282 | 6174 | 6067 | 88.5960 | 36.7376 | 7634 | 7892 | 8150 | 8408 | 866 | 8923 | 9181 | 9439 | 969 | 9 |
| 97 | 6163 | 6055 | 5947 | 5839 | 5731 | 5622 | 5514 | 5405 | 5297 | 89.5188 | $37 \cdot 1203$ | 1464 | 1724 | 1985 | 2245 | 250 | 2766 | 3027 | 3287 | 35 | 97 |
|  | 5402 | 5293 | 5184 | 5074 | 4965 | 4856 | 4746 | 4636 | 4527 | $90 \cdot 4417$ | 37.5030 | 5293 | 5556 | 5820 | 6083 | 6346 | 6609 | 6873 | 7136 | 739 | 98 |
|  | 4641 | 4531 | 4420 | 4310 | 4199 | 4089 | 3978 | 3867 | 3757 | 91：3646 | 37•8857 | 912 | 938 | 9655 | 9921 | －187 | 0452 | 0718 | 0984 |  | 99 |
| 100 | 3880 | 3768 | 3657 | 3545 | 3434 | 3322 | 3210 | 3098 | 2987 | 92．2875 | 38．2683 | 2952 | 3221 | 3490 | 3758 | 4027 | 4295 | 4564 | 4832 | 5101 | 100 |
|  | 30 | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | $26^{\prime}$ | $25^{\prime}$ | $24^{\prime}$ | $23^{1}$ | $22^{\prime}$ | $21^{\prime}$ | 30 | $29^{\prime}$ | $128^{\prime}$ | $127^{\prime}$ | 26 | 25 | $24^{\prime}$ | 23 | $22^{\prime}$ |  |  |
| 67 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $67^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES


TRAVERSE TABLES．

| $23^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $23^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{7}$ | 11 | 12 | $13^{\prime}$ | $14^{\prime}$ | 15 | 16 | 17 | 18 | 19 |  | $11^{\prime}$ | 12 | 13 | 14 | $15^{\prime}$ |  | 17 |  |  |  |
|  | 919 | 919 | 9191 | 919 | 9189 | 918 | 9187 | 9186 | 91 | ． 9183 | －3934 | 3937 | 3939 | 3942 | 3945 | 3947 | 3950 | 3953 | 3955 | 3958 |  |
|  | 83 | 838 | 8383 | 83 | 8378 | 837 | 8374 |  |  |  | 7868 | 7873 | 7879 | 7884 | 7890 | 7895 | 7900 | 7906 | 79 | 7916 |  |
|  | 7581 | 7577 | 7574 | 7571 | 7567 | 7564 |  | 7557 | 7553 | 2.755 | ． 1802 | 1810 | 1818 | 1826 | 1834 | 1842 | 1850 | 1858 | 1866 | 187 |  |
|  | 6775 | 6770 | 6765 | 6761 | 6756 | 6752 |  | 6742 | 6738 | 3.673 | 5736 | 5747 | 5758 | 5768 | 577 | 57 | 580 | 581 | 5822 | 5833 |  |
|  | 596 |  |  |  |  |  |  |  | 5922 |  | ． 9670 | 96 | 969 | 9710 | 972 | 973 | 975 | 976 | 9777 | 9791 |  |
|  | 516 | 5155 | 5148 | 5141 |  | 5127 | 512 | 5114 | 5107 | 5.510 | ＇3604 | 3620 | 3637 | 3653 | 3669 | 368 | 370 | 37 | 3733 | 3749 |  |
|  | 435 | 43 | 43 | 4331 | 43 | 4315 | 43 | 42 |  |  |  |  | 7576 | 75 | 7613 | 7632 | 76 |  |  | 7707 |  |
|  | 35 |  | 3531 | 3522 | 35 | 3503 |  |  |  |  | 3.1473 | 149 | 1515 | 1537 | 15 | 15 | 160 | 1622 | 464 | 1665 |  |
|  | 2743 |  |  |  |  |  |  | 2671 | 2660 |  | ， | 5431 | 5455 | 5479 | 55 | 552 | 5551 | 5575 | 5599 | 5623 |  |
| 10 | 1936 | 1925 | 1914 | 190 | 1891 | 1879 | 1868 | 1856 | 45 | 9183 | 3．939 | 367 | 9394 | 9421 | 94 | 947 | 9501 | 28 | 9555 | 9581 | 10 |
| 11 | 113 | 1117 | 1105 | 1092 |  |  |  |  |  | 0.101 | 4.3275 | 3304 |  | 3363 | 3392 | 3422 | 3451 |  | 3510 |  | 11 |
| 12 | 032 |  |  |  |  |  |  |  |  | 11.02 |  |  |  |  |  | 7369 | 7401 |  | 465 |  | ， |
| 13 | 9517 | 95 | 9488 | 94 | 9458 | 94 | 942 | 94 | 93 | 11.93 | 1143 | 11 | 1212 | 1247 | 128 | 13 | 1351 |  | 1421 |  |  |
| 14 | 871 |  |  |  |  | 8631 | 8615 | 85 | 85 | 12.85 | 507 | 51 | 5152 | 5189 | 522 | 5264 | 53 | 5339 | 5376 | 5414 | 14 |
| 15 | 790 | 7887 | 7870 |  | 7836 | 7819 | 7801 | 778 | 776 | 13 | ．9011 | 9051 | 909 | 9131 | 917 | 9212 | 92 | 9292 | 9332 | 9372 | 5 |
| 16 | 70 | 7080 | 7062 | 7043 | 7025 | 7007 | 6988 | 6970 | 6951 | 14 | $6 \cdot 2945$ | 2988 | 3031 | 3073 | 311 | 3159 | 3202 | 3245 | 3287 | 3330 | 6 |
| 17 | 629 | 627 |  | 6234 | 6214 | 6195 |  |  |  |  |  |  | 6970 | 216 |  |  |  |  |  |  |  |
| 18 | 548 | 54 |  | 5424 | 5403 | 5382 |  |  |  |  |  |  | 0910 | 095 | 1006 | 1054 |  |  | 1198 |  | 18 |
| 19 | 467 | 465 | 4636 | 4614 | 43 |  |  |  |  | 17 |  |  |  |  |  |  |  |  |  |  |  |
| 20 | 387 |  |  |  | 37 |  |  |  |  | 18 |  |  |  |  |  |  |  |  |  |  | 20 |
| 21 | 30 |  |  | 2994 |  | 2946 |  |  |  | 19.285 | 2615 | 267 |  | 278 | 2840 | 288 |  |  |  |  | 21 |
| 22 | 226 | 22 | 22 | 2185 | 21 | 21 | 21 |  | 2058 | 20 | 655 |  |  |  | 67 |  |  |  |  |  | 22 |
| 23 | 145 |  |  |  |  | 1322 |  |  |  | 21.12 | 0484 | 0545 | 0607 | 0668 | 073 | 07 | 08 | 091 | 0975 | 1037 | 23 |
| 24 | 064 | 06 |  | 056 | 0537 |  | 0482 |  |  |  |  | 4482 | 4546 | 46 | 46 | 47 | 4803 | 4867 | 4931 | 499 | 24 |
| 25 | 984 | 98 | 9784 | 975 | 9727 | 9698 | 966 |  |  | $22^{\prime} 9583$ | 9．8352 | 8419 |  | 85 | 8619 | 8686 |  | 20 | 8886 | 8953 | 25 |
| 26 | 90 | 9005 | 8975 | 8945 | 8916 | 8886 | 8856 | 8826 | 8796 | $23 \cdot 876$ | 10 | 2355 | 2425 |  |  |  | 2703 | 2772 |  |  | 26 |
| 27 |  |  |  | 8136 | 8105 |  |  |  |  |  | 10.6220 |  |  |  |  |  |  |  |  |  |  |
| 28 | 742 | 7390 | 7358 | 7326 | 72 | 72 | 72 | 7197 | 7165 | 25 | 11 | 02 | 0304 | 03 | 0453 | 05 | 0603 | 0678 | 0753 | 082 | 28 |
| 29 | 66 |  |  |  | 6483 |  |  |  |  | 26 | $11 \cdot 4088$ | 41 | 4243 | 43 | 43 | 44 | 4553 | 463 | 4708 |  |  |
| 30 | 580 |  |  |  | 5672 |  |  |  | 5534 | ， |  |  |  | 826 | 8343 | 8423 | 8503 | 858 | 8664 | 37 | 30 |
| 31 | 500 | 4967 | 4932 | 4896 | 4861 | 4825 | 4790 | 4754 | 4718 | 28.4683 | 12．1956 | 203 | 212 | 220 | 228 | 237 | 2453 | 2536 | 2619 |  | 31 |
| 32 | 419 | 41 | 4123 | 4087 | 4050 | 4013 | 397 |  |  |  |  |  |  | 61 |  |  |  |  | 657 |  | 32 |
| 33 |  |  |  | 277 |  |  |  |  |  | 30．30 | $12 \cdot 9824$ |  |  |  |  |  |  |  |  |  | 33 |
| 34 | 258 | 25 | 2506 | 2467 | 24 | 23 | 2350 | 231 | 22 | 31.223 | $13 \cdot 3758$ | 38 | 3940 | 40 | 41 | 42 | 4304 | 4395 | 448 | 457 | 34 |
| 35 | 177 | 173 | 1697 | 1657 | 16 | 15 | 1537 | 1496 | 14 | $32 \cdot 1$ | $13 \cdot 7692$ | 77 | 78 | 797 | 80 | 81 | 25 | 8347 | 8441 |  | 35 |
| 36 | 0971 | 0930 | 0889 | 0847 |  |  |  |  |  | 33.059 | 14.16 |  | 1819 |  |  |  |  |  |  |  |  |
| 37 | 01 | －1 | － | 1038 |  |  |  |  |  | $33 \cdot 97$ |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 93 | 93 | 927 | 9228 | 9184 | 914 |  |  | 9010 | 34.89 | 14 |  |  |  |  | 1003 | 0104 | 0206 | 030 |  | 38 |
| 39 | 85 |  | 析 |  |  |  |  |  |  | $35 \cdot 814$ | 15 | 353 | 3637 |  |  | 3950 | 05 | 4159 |  |  |  |
| 40 | 774 | 7700 | 7654 |  |  | 751 | 747 | 7425 | 矿 | 36.7333 | $15 \cdot 73$ | 7470 | 757 | 7684 | 77 | 7898 | 8004 | 811 | 821 | 83 | 40 |
| 41 | 693 |  |  |  |  | 6704 | 665 |  | 6563 | 37.651 | 16.129 | 1407 |  |  |  |  |  |  |  |  |  |
| 42 | 61 |  |  |  |  |  |  |  |  | 38.56 |  |  | 545 |  |  |  |  |  |  |  | 42 |
| 43 | 53 | 527 | 52 | 5179 | 51 |  |  |  | 493 | 39 | 16 |  | 93 |  |  |  | 9835 | 9970 |  |  | 43 |
| 44 | 45 | 447 | 44 | 4369 | 4319 |  |  | 4167 | 4116 | 40 |  | 321 | 33 | 3452 |  |  | 3805 | 3922 | 4040 |  | 44 |
| 45 | 37 |  |  | 355 | 3508 | 345 |  |  |  | 41 | 17.7033 | 71 | 7274 | 73 | 7514 | 7635 | 7755 | 7875 | 7995 | 116 | 45 |
| 46 | 290 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 210 |  |  | 19 | 18 | 1832 |  |  | 168 | 43.16 | 18.4 |  | sis | 52 |  |  |  | 57 |  |  | 47 |
| 48 | 129 |  |  | 1130 | 1075 |  |  |  | 08 | $44^{\circ} 07$ | 18.88 |  | 903 | 922 |  |  |  |  |  |  | 48 |
| 49 | 048 | 0432 |  | 320 | 0264 | 0208 | Ors |  | －03 | $44^{\circ} 9$ | $19^{\circ}$ | 290 | 303 | 316 |  | 342 | 355 | 368 | 3817 |  | 49 |
| 50 | 968 |  |  | 9510 |  | 93 | 38 | 928 | 9223 | 45.916 | 19.67 | 603 |  | 710 | 723 | 7372 | 750 | 763 | 777 | 790 | 50 |
| 51 | 88 | 8817 |  |  |  |  |  |  |  | $46 \cdot 93$ |  | 077 |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  | 7891 |  |  |  |  |  | 47753 |  |  | 48 |  |  |  |  | 554 |  |  |  |
| 53 | 726 | 72 | 7142 | ， | 7020 | 69 |  |  | 677 | 48.67 | 85 |  | 87 | 89 |  |  | 93 | 94 | 963 | 978 | 53 |
| 54 | 645 |  |  | 6 |  |  |  |  |  | 49 | $\cdot{ }^{2}$ | 25 | 272 | 287 |  | ， | 330 | 345 | 359 |  | 54 |
| 55 | 56 | 558 | 5524 | 546 | 5398 | 5335 | 527 |  |  | 50．5082 | 21.6374 |  |  | 6815 |  |  |  | 403 | 550 |  | 55 |
| 56 | 484 | 4780 | 4716 | 465 | 458 | 4523 |  |  | 433 | $51 \cdot 42$ |  |  | 0607 |  |  |  |  |  |  |  | 56 |
| 57 | 4038 |  |  |  |  |  |  |  |  |  |  |  | 45 |  |  |  |  | 530 |  | 5613 |  |
| 58 | 323 | 31 |  | 303 |  |  |  |  | 26 | 5 |  |  |  |  |  |  |  | 析 |  |  | 58 |
| 59 | 242 | 23 | 2290 | 2222 | 21 | 208 | 20 | 195 | 188 |  |  | 226 | 24 | 25 | 27 |  | 305 | 321 | 337 | 352 | 59 |
| 60 | 1619 | 1550 | 81 | 1412 | 1344 | 127 |  | 1137 | 1068 | 5699 | $23 \cdot 6044$ | 6205 |  |  |  | 6846 | 7007 | 7167 | 7327 | 728 | 60 |
| 61 | 081 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | －00 | 993 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 920 |  |  | 8983 | 1081 | 883 |  |  | 862 | 57－85 | 24.78 | 80 |  | 83 |  |  | 88 | 902 | 91 | 93 | 63 |
| 64 | 839 |  |  |  |  |  |  |  |  |  |  |  | 212 | 229 |  |  | 2807 | 297 | 314 |  | 64 |
| 65 | 758 | 751 |  |  |  | 721 | 714 | 70 |  | 59.69 |  |  |  |  |  |  | 675 |  |  |  | 65 |
| 66 | 678 |  |  | 6554 | 6478 |  | 632 | 6251 |  | $60^{\circ} 60$ |  |  |  |  |  |  |  |  |  |  | 66 |
| 67 |  |  |  |  |  |  |  | 54 | 535 | 61．52 | $26 \cdot 35$ |  |  |  |  |  |  |  |  |  |  |
| 68 | 516 | 50 | 5012 | 4934 | 485 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 68 |
| 69 | 436 |  | 4203 | 4124 | 40 | 39 |  | 380 | 372 | $63 \cdot 36$ | $27 \cdot 14$ | 1635 | 182 | 200 | 21 | 237 | 255 | 274 | 29 |  | 69 |
| 70 | 355 |  |  |  | 3234 |  |  | 2993 | 2912 | 64．2832 | 27.538 | 557 | 57 | 5 | 1 |  | 6508 | 669 |  | 70 | 70 |
| 71 | 27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 71 |
| 72 | 19 | 186 | 177 | 1695 | 1612 | 153 | 144 | 1364 | 1281 |  |  |  | 363 | 38 | 4023 |  |  |  |  |  | 72 |
|  | 135 |  |  | 885 | 1812 | 0718 | O634 | 0550 | 0466 | 67.0382 | 28.71 | 7382 | 757 | 777 | 79 | 8163 | 8358 | 855 | 87 | 89 | 73 |
| 74 | 0330 | 0245 | 60 | ＊075 | 9990 |  |  |  |  |  |  | 131 | 151 | 515 | 585 | 618 |  |  |  |  |  |
| 75 | 9523 | 9437 | 9351 | 9266 | 9180 | 9093 | 9007 | 8921 | 883 | 68.8748 | 29.50 | 525 | 545 | 565 | 585 | 210 | 25 | 645 | 665 |  | 75 |
| 76 | 87 | 8630 | 8543 | 8456 | 8369 | ${ }^{82}$ | 819 | 8107 | 8019 | 69.793 | 29.89 | 919 | 939 | 95 | 980 | －005 | 0208 | 041 | 0615 |  | 76 |
| 78 | 7911 |  |  |  |  |  |  |  | 7204 |  | 30．2923 | 312 | 3335 | 354 |  |  | 4159 | 436 | 45 | 左 |  |
| 78 | 7104 | 7015 | 926 | 683 | 674 | 665 | 6568 | 6478 | 6388 | 71.629 | 30.685 | 7066 | 7275 | 748 | 7692 | 7900 |  | 831 | 85 |  | 78 |
| 80 |  | 0， | 308 | 6026 | 5 | 5033 |  | 664 | 5573 | $72 \cdot 548$ | $31 \cdot 079$ | 100 | 1214 | 142 | 163 | 18 | 20 | 227 | 248 | 26 | 79 |
| 80 | 5492 | 00 | 208 | 5217 | 5125 | 5033 | 49 | 4849 | 4757 | $73 \cdot 466$ | $31 \cdot 472$ | 4940 | 5154 | 536 | 163 | 5795 | 20， | 622 | 643 | 268 | 80 |
| 81 | 4685 | 4592 | 00 | 4407 | 4314 | 422 |  |  |  |  | 86 |  |  |  |  |  |  |  |  |  |  |
| 8 | 3879 |  | 3691 | 359 | 35 | 340 | 33 | 3220 | 3126 | $75 \cdot 303$ | $32 \cdot 259$ | 2813 | 3032 | 3252 | 347 | 3690 | 3909 | 4128 | 433 | 456 | 82 |
| 83 | 3072 | 2977 | 2882 |  | 2 |  |  | 析 | 231 | 1010 | $32 \cdot 65$ | 6750 | 6972 | 719 | 1476 | 5 | 8859 | S08 | 830 | 硣 | 83 |
| 84 | 2266 | 2170 | 2074 | 1977 | 188 | 178 | 168 | 1592 | 1495 | $77 \cdot 1398$ | 33.046 | 0687 | 0911 | 113 | 13 | 158 | 1809 | 2034 | 225 |  | 84 |
| 85 | 146 |  |  |  |  |  |  | 0777 | 0679 | $78^{\circ} 0582$ | 33－439 | 462 | 485 | 5078 | 5305 | 5532 | 5759 | 598 | 62 | 64 | 85 |
| 86 | 0653 | 0555 |  |  |  |  |  |  | 9864 | 78.976 | 33.833 | 8560 | 8790 | 9020 | 9250 | ， | 3710 | 9939 | ＋16 | 339 | 86 |
| 87 | 984 | 975 | 9648 | 954 | 9848 | 9348 | 9248 | 9148 | 9238 | 80．81 | 34.236 | 2497 | 2729 | 29 | 138 | 3437 |  | 析 | d |  | 87 |
| 88 | 9041 | 40 |  |  |  | 8536 | 8435 | 8334 | 8233 | 80．813 | $34 \cdot 619$ | 6434 | 666 | 69 | 71 | 737 | 7610 | 7845 | 808 | 83 | 88 |
| 89 | 8234 | 8132 | 30 | 7928 | 7826 | 772 |  |  | 7417 |  |  | 370 | 0608 | 084 |  | 132 | 56 | 1798 | 203 |  | 89 |
| 90 | 742 | 7325 | 7222 | 7119 | 7015 | 6912 | 6809 | 6705 | 6602 | 82.649 | 35．40 | 4307 | 6 | 488 | 502 | 527 | 551 | 575 | 599 | 623 | 90 |
|  | 6622 | 571 |  | 6309 | 620 | 6100 | 5995 | 5891 | 5786 | 3.568 | $35 \cdot 800$ | 8244 | 3487 | 873 | 89 | 9217 | 9460 | 970 | 994 |  |  |
| 92 93 | 581 | 5710 | 56 | 5498 | 5358 | 5288 | 518 | 5076 | 4971 | 84：486 | 36．1935 | 2181 | 2427 | 2673 | 2918 | 316 | 3410 | 365 | 390 | 418 | 92 |
| 93 | 5009 | 4902 | 4796 | 4689 | 4583 | 4476 | 4369 | 4262 | 4155 |  | 36 | 6117 | 6366 | 66 | 6863 | ， | 7360 | 760 | 857 |  | 93 |
| 94 | 42 | 4095 | 3987 | 3879 | 377 | 266 | 5 |  | 3340 |  | 36．9803 | －054 | 030 | 05 | 0808 | 105 | 1310 | 1562 | 181 | 206 | 94 |
| 95 | 33 | 3287 | 3179 | 3070 | 296 | 285 |  |  |  | 4 | 37－3737 |  | 424 | 4499 | 4753 | 5007 | 261 | S | 5768 | 602 | 95 |
| 96 | 2590 | 24 | 2370 | 2260 | 2150 | 2040 | 1929 | 1819 | 209 | 88．1598 |  |  | 8184 |  |  |  | 9211 |  |  |  |  |
| 97 | 1783 | 1672 | 5753 | 1450 | 1339 | 1227 | 1116 | 1005 | 0893 | 89.07 | 38．16 | 18 | 2124 | 238 | 2642 | 29 | 3161 | 3420 | 3679 | 3938 |  |
| 98 99 | 0977 | 0865 | 0753 9944 | 0640 | 0528 | 0415 | 036 | 0190 | －077 | 89.996 | 58963 | 5801 | 6063 | 6325 |  | 879 | 7111 | 7373 | 763 | 789 | 98 |
|  | 0171 | －057 | 9944 | 4830 | 9717 | 9603 | 9490 | 9376 | 9262 | 90．9148 | 38.9473 | 9738 | －002 | 0267 | 0532 | 0796 | 1061 | 1326 | 1590 | 855 |  |
| 100 | $\frac{9364}{50}$ | 9250 | 9135 | 9021 | 8906 | 8791 | 86 | 8561 | 8446 | 91－8331 | 39•3407 | 3675 | 3942 | 4209 | 4477 | 4744 | 5011 | 5278 | 5546 | 5813 | 100 |
|  | $50^{\prime}$ | 49 | $48^{\prime}$ | 47 | $46^{\prime}$ | $45^{\prime}$ | 44＇ | $43^{\prime}$ |  | 41 ${ }^{\prime}$ | SU＇ | ＇ | $48^{\prime}$ | $7^{\prime}$ | $46^{\prime}$ | $45^{\prime}$ | $44^{\prime}$ | $43^{\prime}$ |  | 41＇ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $66^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

| $23^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | 23 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 40 | 41 | $42^{\prime}$ | 43 | $44^{\prime}$ | $45^{\prime}$ | 46 | 47 ${ }^{\prime}$ | 48＇ | 49＇ | $40^{\prime}$ | $41^{\prime}$ | $42^{\prime}$ | 43＇ | 4 | $45^{\circ}$ |  |  |  |  |  |
|  | 915 | 9158 | 9157 | 9155 | 915 | 915 | 91 | 9151 | 9150 | 9148 | 14 | ， | 4019 | 4022 | 025 | 4027 | 4030 | 4033 | 4035 |  |  |
|  | 83 | 8316 | 831 | 83 | 83 |  |  | 8302 |  |  |  | 8034 |  |  |  | 805 |  |  |  |  |  |
|  | 7477 | 7473 | 7470 |  | 7463 | 74. | 7456 | 74 |  |  | 42 |  | 2058 |  | 2074 | 2082 | 2090 | 213 | ， |  |  |
|  | 6636 | ${ }^{6631}$ | 6627 | 66 | 6617 | 66 | 6608 | 66 |  | 4．580 |  | 6067 | 6078 | 608 | 6099 | 6110 | 6121 | 613 | 6142 |  |  |
|  | 579 | 578 | 57 | 5777 | 577 | 57 | 5760 | 5754 |  | 4.5 | $2 \cdot 0$ | 0084 |  | 0111 | 0124 | 0137 | 0151 |  | 0177 |  |  |
|  | 4954 | 4947 | 4940 | 4933 | 4926 | 4919 | 14912 | 4905 | 4898 | 5.488 | $2 \cdot 4085$ | 410 | 4117 | 4133 | 4149 | 4165 | 4181 | 4197 | ${ }^{4213}$ | 422 |  |
|  | 4113 | 4105 | 409 | 3 | 40 | 40 | 4064 | 4055 | 4047 | ${ }^{6} 7.4039$ | $2 \cdot 80$ | 8118 | 8136 | 8155 | 8174 | 8192 | 8211 | 8230 | 8248 |  |  |
|  | 3272 | 3262 | 3253 | 3244 | 3234 | 32 | 3216 | 3206 | 3197 | $7 \cdot 318$ | 3.2113 | 2135 | 2156 | 2177 | 2198 | 222 | $224!$ | 2262 | 2284 |  |  |
|  | 243 | 24 | 24 |  |  | 2378 | 2367 | 2357 | 2346 | 8.2336 | 3.6127 | 6151 | 6175 | 6199 | 6223 | 6247 | 6271 | 6295 | 6319 |  |  |
| 10 | 1590 | 1578 | 156 | 1555 | 1543 | 1531 | 1519 | 1508 | 1496 | 484 | 4.0142 | 0168 | 0195 | 0221 | 0248 | 0275 | 0301 | 0328 | 0355 |  |  |
| 11 | 074 | 073 | O7 |  |  |  | 0671 | 0658 | 0646 | 10.063 | 4.4156 | 418 | 421 | 4244 | 4273 | 4302 | 4331 | 4361 |  |  |  |
| 12 | 99 | 98 |  |  | 9851 |  | 98 | 988 | 9795 | 10.9781 | 48170 | 8202 | 8234 | 8266 | 8298 | 8330 | 836 |  |  |  |  |
| 13 | 908 | 9051 | 90 | 9021 |  |  |  | 89 | 8945 | 11 | 84 | 2219 | 2253 | 228 | 232 | 235 | 2392 |  | 2461 |  | 3 |
| 14 | 8225 |  |  |  |  |  |  | 8111 |  |  |  | 6235 | 73 |  |  |  | 6422 |  |  |  | 14 |
| 15 | 738 |  |  |  |  | 7297 |  | 72 | 7244 | 13.7 | 6. | 0252 | 2 | 3 | 0372 | 0412 |  |  | 2 |  |  |
| 16 | 6543 |  |  |  |  |  |  | 6412 | 6394 | 14 | 6＇4226 | 4269 | 4312 | 4354 | 4397 |  | 2 | 4525 | 7 |  |  |
| 17 | 57 | 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 | 4861 | 4840 | 4819 | 47 | 4777 | 4756 | 4735 | 4714 | 4693 |  | 7.2255 | 2303 | 2351 | 2392 | 2445 | 2494 | 2542 | 2590 | 2638 |  |  |
| 19 | 4020 |  | 3976 | 3954 | 39 | 39 | 3887 | 3865 | 3842 |  | 8．02 | 6319 | 6370 | 642 | 049 | 652 | 6572 | 662 | 4 |  |  |
| 20 | 3179 | 3156 | 313 | 1 | 3086 | 3062 | 3039 | 3015 | 2992 | 18.296 | 8.0283 | 0336 | 0390 | 0443 | 0496 | 0549 | 0603 | 0656 | 0709 |  |  |
| 21 | 2338 | 2314 | 228 | ${ }^{2265}$ | 2240 | 2215 | 2191 | 2166 | 2142 | 19.211 | 8.4297 | 4353 | 4409 | 4465 | 452 | 4577 | 4633 | 4689 | 4745 |  | 1 |
| 22 | 149 | 147 | 14 | 14 | 1394 | 13 | 1343 | 13 | 1291 | 20 | 88311 | 837 | 8429 | 8487 | 85 | 8604 |  | 8721 |  |  | 2 |
| 23 | 06. | 06 | 0602 | 057 | 05 | 05 | 0495 | 04 | 0441 | 21 | 9． 2325 | 238 | 2448 | 25 | 25 | 2632 | 2693 | 2754 | 2815 |  | ${ }^{23}$ |
|  |  |  |  |  |  | 96 |  | 96 |  |  | 9.6340 | 640 | 64 | 653 | 659 | 6 |  |  |  |  | 24 |
| 25 | 897 | 8945 |  |  | 88 |  | 8799 | 8769 | 8740 | 22 | $0 \cdot 03$ | 042 | 0487 | 0554 |  | 0687 | 0753 | 0820 | 0886 |  | 25 |
| 26 | 8133 | 8103 | 8072 |  | 8011 |  |  |  |  | 23 | 10.4368 |  |  |  |  |  |  |  |  |  |  |
|  | 7292 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 析 |
| 28 | 645 | 64 |  | 6353 |  | 62 | 62 | 6232 | 61 | 25. |  |  |  |  |  |  | 2844 | 29 | 2993 |  |  |
| 29 | 56 |  |  |  |  | 545 | 5406 | 5372 | 5338 |  | 11．6410 | 6488 | 6565 | 66 | 6719 | 6797 | 6874 | 695 |  |  | 析 |
| 30 | 47 | 47 | 4699 | 466 | 46 | 4593 | 4558 | 452 | 44 | $27 \cdot 4453$ | 12.0425 | 504 | 058 |  | 0744 | 0824 | 0904 |  | 1064 |  |  |
| 31 | 3928 | 3892 | 3855 | 38 | 3783 | 3747 | 3710 | ${ }^{3674}$ | ${ }^{3638}$ | 28.36 | 12．4439 | ${ }^{452}$ | 4604 | 46 | 4769 | 485 | 493 | 501 | 5099 |  | 31 |
| 32 | 308 | 30 |  |  |  |  |  | 28 | 27 | 29．2750 | 12.843 | 8538 | 8623 | 8709 | 8794 |  |  |  | 34 |  |  |
| 33 | 22 | 22 | 1 | 2130 | 20 | 20 | 2014 | 1975 | 1937 | 30 | 13.2467 | 2555 | 2643 | 2731 | 281 | 29 | 94 |  |  |  | 33 |
|  |  | 1365 | 1325 |  | 12 | 1206 |  |  | 1086 |  |  | 657 | 6662 | 677 | 68 | 69 | 7024 |  |  |  | 34 |
| 35 | 05 | 0523 | 0482 | 0461 | 0400 | 03 | 0318 |  | 023 | 32 | 14.04 | 058 | 0682 | 077 | 086 | 096 | 1055 | 1148 | 1241 |  | 5 |
| 36 | 97 |  |  |  | 9554 |  | 9420 | 9428 |  | 32．93 | 14.45 | 46 |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 875 |  | 86 | 862 | 8578 | 8535 | $33 \cdot 8$ | 14：85 |  | 87 | 881 | 89 |  | 9115 |  |  |  | 37 |
| 38 | 80 |  |  |  |  |  |  |  |  |  |  |  |  | 2841 |  |  | 3145 |  |  |  | 38 |
|  | 72 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7383 |  | 析 |
| 40 | 63 | 6312 | 6265 | 62 | 6171 | 6125 | 6078 | 6031 | 5984 | 36 | 16.0 | 067 | 0779 | 0886 | 09 | 1099 | 205 | 1312 | 1418 |  |  |
| 41 | 5517 | 5470 | ${ }^{5422}$ | 53 | 5326 | 52 | 5230 | 5182 | 5133 | 37．50 | $16 \cdot 4580$ | 468 |  | 4908 |  | 51 | 5235 | 5344 | 5454 |  |  |
|  | 4676 | 462 | 45 |  |  | 443 | 4382 | 4332 | 4283 | 38.42 |  | 8706 | 8818 | 89 | 90 | 915 | 265 | 9377 |  |  |  |
| 43 | 383 | 3785 | 373 | 36 | 3634 | 35 | 3534 | 3483 | 3433 | 39.33 |  | 2723 | 2838 | 2952 |  | 31 | ， | 341 |  |  | 43 |
|  |  | 29 | 2 | 2840 | 2789 | 2737 |  | 263 | 2582 | 40.2531 | $17 \cdot 6623$ |  | 6857 | 69 | 7091 | 7209 | 7326 | 744 |  |  | 44 |
| 45 | 2153 | 210 | 2048 | 1996 | 1943 | 1890 | 183 | 1785 | 1732 | $41 \cdot 167$ | 18.063 | 0757 | 0877 | 099 | 111 | 123 | 1356 | 147 | 159 | 1715 | 45 |
|  | 13 | 1259 | 1205 | 1151 | 1097 | 1043 | 0989 | 35 | 0881 | $42^{\circ}$ | 18.4 | 4773 | 489 | 50 | 51 |  |  |  |  |  |  |
| 47 | 047 | 0416 |  | 0306 | 0251 |  |  |  | 1031 | 42. | 18 | 8790 |  |  |  |  |  |  |  |  |  |
| 48 | 963 | 957 | 9518 |  | 94 |  |  |  | 9 | 43 | 19.2 | 280 | 2935 | 30 | 31 | 331 | 46 | 3574 | 370 |  | 8 |
|  | 87 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 773 |  |  |
| 50 | 79 | 789 | 783 | 7773 | 7714 | 7656 | 7597 | 7539 | 7480 | 45.7421 |  | 084 | 0974 | 1107 | 1240 | 1373 | 6 | 1640 | 73 |  |  |
|  | 710 |  |  | 69 |  |  |  |  | 66 | 46 |  | 485 |  |  |  |  |  | 5672 | 15808 |  | 51 |
| 52 | 6266 | 6205 | 61 | 5 | 60 |  |  |  | 57 | 47 |  | 887 |  |  |  |  |  |  | 344 |  | 2 |
| 53 | 542 | 5363 | 53 | 52 | 5177 | 511 | 5053 | 4991 | 4929 | 48.4866 | 212 | 289 | 3032 | 317 | 331 | 345 | 3597 | 373 | 387 |  | 53 |
| 5 | 458 | 45 | 4458 | 43 | 4331 | 42 | 4205 | 4142 | 4078 | 49．4015 | 21 | 690 | 7052 | 71 |  | 748 |  | 析 | 7914 |  | 54 |
| 55 | 3743 | 3679 | 361 | 355 | 3486 | 3421 | 3357 | 3292 | 3228 | 50．3163 | 22．0778 | 092 | 1071 | 1218 | 136 | 151 | 165 | 180 | 1950 |  | 5 |
|  | 290 | 2837 | 27 | 270 | 264 | 2574 | 2509 | 2443 | 2377 | 51 | 22．47 | 494 | 5091 | 524 | 53 | 55 | 87 |  |  |  | 56 |
| 57 | 206 | 19 | 19 | 1861 | 1794 | 17 | 16 | 15 | 1527 |  | 22.88 | 8958 | 913 | 92 | 94 |  | 17 |  | 1021 |  |  |
|  | 122 | 11 |  | 10 |  | 08 | 08 |  | 0677 | 53 | $23 \cdot 28$ | 2975 | 313 | 328 | 34 | 35 | 47 | 3902 | 4056 |  | ${ }^{5}$ |
|  |  |  |  | $\bigcirc$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 | 953 |  | 9398 |  |  | 918 | 917 | 9046 | 8976 | 54．8905 |  | 1009 |  | 1328 |  |  | 1808 | 196 | 2127 |  |  |
| 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 701 | 69 | 68 | 6794 | 6720 | 6646 | 6572 | 6499 | 64 | 57．63 | $2{ }^{25}$ | 305 | 3227 | 339 |  | 373 | 3898 | 4066 | 4234 |  | 63 |
| ${ }^{4}$ | 617 |  |  | 5949 |  |  |  |  | 55 | 58.54 | 25 | 7076 |  | 747 |  | \％ | 7928 | 80 |  |  | 65 |
| 65 | 5333 | 5257 | 5181 | 5105 | 5029 | 4952 | 4876 | 4800 | 4724 | 59：4647 | $26^{\circ} 0920$ | 1093 | 1266 | 143 | 1612 | 178 | 1958 | 2131 | 2304 |  |  |
| 66 | 4492 | ${ }^{4414}$ | 4337 | 4260 | 4183 | 4106 | 4028 | 3951 | 3873 | 60．3796 | 26：4934 | 5110 | 5286 | 5461 | 5637 | 5813 | 5989 | 6164 | 6340 |  | 66 |
| 67 | 365 | 357 | 349 |  | 3 | 2 |  | 3102 | 3023 | 61.29 | 22. | 9127 | 9365 | 94 | 968 | 9840 | 19 |  | 11 |  |  |
| 68 |  | 27 | 26 | 2571 | 24 | 24 | 23 | 2252 | 2173 | 62.209 | 27.29 | 3143 | 3325 | 350 | 368 | 386 | 49 | 423 | 4411 |  | 68 |
| 69 |  | 188 |  | 1726 |  |  |  | 1403 | 1322 | $63 \cdot 12$ |  |  | 734 | 75 | 771 | 789 | 8079 | 82 |  |  | 69 |
| 70 | 112 | 104 |  |  | 0800 | 0718 |  | 055 | 0472 | 64 | 28. | 1177 |  |  | 173 |  | 2109 |  |  |  |  |
|  | 02 |  | 0120 | ＋0 | 9954 | 9871 |  |  |  |  |  | 519 | 5383 |  |  |  | 6139 |  |  |  |  |
|  |  |  |  | 91 | 1 | 90 | 89 | 88 | 8771 | $65 \cdot 8$ | 28 | 92 | 940 | 959 | 978 | 997 | \＃169 | 0361 | 0553 |  | 72 |
|  | 860 | 85 | 8434 | 83 |  | 817 |  |  | 791 |  |  | 722 | 3422 |  |  |  | 硡 | － |  |  | 73 |
| 74 | 776 |  |  |  |  |  |  |  |  |  |  | 1261 |  |  |  |  |  |  |  |  | 74 |
| 75 | 6922 | 6835 |  | 60s | 㖪 | 6484 |  | 639 | 6220 | $68 \cdot 6132$ | 30．106 | 1261 | 1461 | 186 | 1860 | 2060 | 230 | 24 |  |  | 75 |
| 76 | 6081 | 5992 | 59 | 581. | 57 | 563 | 55 | 5459 | 5369 | 69．52 | $30 \cdot 50$ | 5278 | 5480 | 568 | 588 | 6087 | 6290 | 649 | 6694 |  | 76 |
| 77 | 524 | 515 | 502 | 49 | 488 | 47 | 47 |  | 45 | 70 |  | 9295 |  |  |  | 1115 |  |  |  |  |  |
|  | 439 | 43 | 42 | 4126 | 403 | 39 | 38 | 376 | 3659 | 71357 | 31.31 | 331 | 3519 | 777 | 393 | 41 | 4350 | 4558 | 4765 |  |  |
| 79 |  |  |  | 2436 | 3189 | 2249 | 3003 2155 | 2062 | ${ }_{1968}^{2818}$ | 72＇2725 | 31．7118 | 13328 | 753 | 17749 | 7960 1984 | ${ }_{217} 81$ | 8390 2410 | 8590 2623 |  |  |  |
|  |  |  |  | 159 | 1497 | 14 | 130 |  | 7 |  |  | 5362 | 5578 |  |  | 62 |  |  |  |  | 0 |
|  | 1035 | 093 | 0843 | 074 | 06 | 05 | 0459 | 03 | 0267 | 75.017 | 32．91 | 937 | 9597 | 981 | 403 | 02 | 04 | 068 |  |  |  |
|  | 0194 |  |  | 9903 | 9806 | 970 | 96 | 9514 | 9417 | $75 \cdot 931$ | 33．317 | 3396 | 3617 | 38 | 40 | 428 | 45 | 4722 | 4943 |  | 83 |
| 84 | 93 |  |  |  |  | 8862 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 | 8512 | 843 | 8313 | 8214 | 8114 | 8015 | 7915 | 78 | 7716 | $77 \cdot 76$ | 34．1 | 142 | 1656 | 1882 | 2108 | 2335 | 256 |  |  |  |  |
| 86 |  | 7570 | 1740 | 7369 | 7269 | 71 | 7067 | 6966 | 6865 | 78.67 | 34．52 | 544 | 567 | 5904 | 613 | 63 | 659 | 6820 | 7049 |  |  |
| 87 | 683 | 6728 |  | 6525 | 64 | 632 | 62 | ¢1 | 6015 | 7959 | 34 |  | 97218 | 9926 | 1 |  | 062 |  | 1084 |  |  |
| 88 | 5989 | 5886 |  | 5680 | 55 |  | 5371 |  | 5165 | ${ }^{80}$ | 35 | 3488 | 3714 | 39 |  |  |  |  | 5120 |  | 㖪 |
| ${ }_{90} 8$ | 5148 4307 | 4202 | 4096 | 3991 | 3886 | 3780 | 4367 | 3569 | 3464 | ${ }_{82}{ }^{2} 3358$ | 36．1274 | 1513 | 1753 | 1993 | 2232 | 2472 | 2712 | 295 | 319 |  |  |
|  | 3466 | 517 | 325 | 3146 | 3040 | 293 | 28 | 2720 | 2613 | 83.2 | 36．52 | 5530 | 5772 | 60 | 6257 | 6499 | 6742 | 6984 |  |  |  |
|  | 2625 | 251 | 241 | 2302 | 21 | 2087 |  | 1871 | 1763 | 84．1655 | 36．93 | 9547 | 9792 | 1037 | 028 | 05 |  | 101 | 12 |  |  |
|  | 178 | 167 | 156 | 1457 | 1349 | 1240 | 1131 | 1022 | 0913 | $85^{\circ} 0803$ | 37.3316 | 35 | 3811 | 405 | 430 | 45 |  | 505 |  |  |  |
|  |  |  | 0723 |  |  | 03 | 0283 | 0172 | ＋062 | 85.9952 | 37．733 | 758 | 7831 | 808 | 833 | 858 |  |  |  |  |  |
| 95 | 1101 | 991 | 987 | 9768 | 9657 |  | 9435 |  | 9212 | 86.91 | 38.13 | 159 | 1850 | 210 |  |  |  | 3115 |  |  |  |
| 9 | 926 | 析 | － | 8924 |  | 869 | 8587 | 84 | 8361 | 87－824 | 38．535 |  |  |  |  |  | 6892 | 7148 |  |  |  |
|  | 84 |  |  |  |  | 7852 |  |  |  | 88.739 89.654 | 38 |  | 988 | ＋1／1 |  |  |  |  |  |  |  |
|  |  | 662 |  |  |  |  |  |  | ${ }_{5810}^{6661}$ |  | 9 |  |  |  |  |  |  |  |  |  |  |
| 100 | 5896 | 578 | 663 | 546 | 5429 | 5312 | 5194 | 5077 | 4960 | 91．4842 | 40.1415 | 1681 | 1948 | 2214 | 2480 | 2747 | 3013 | 3279 | 3545 |  | 100 |
|  | $20^{\prime}$ | $19^{\prime}$ | 18 | $17^{7}$ | $16^{\prime}$ | $15^{\prime}$ | 14 | $13^{\prime}$ | $12^{\text {a }}$ | 11 | $20^{\prime}$ | 19 | 18 | 17 | 16 | $15^{\prime}$ | $14^{\prime}$ | 13 | 12 | 1 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $23^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $23^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | 52 | 53 | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | 58 | $59^{\prime}$ | $50^{\prime}$ | 51 | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | 55 | 56 | 57 | 58 | $59^{\prime}$ |  |
|  | 9147 | 9146 | 9145 | 9144 | 9143 | 9161 | 9140 | 9139 | 9138 | 13 | 04 | 4043 | 404 | 4049 | 405 | 4054 | 405 | 405 | 4062 | 4065 |  |
| 2 | 82 |  |  |  |  |  |  | 析 | 827 | 182 |  | 8087 | 8092 | 8098 | 8103 |  | 81 | 81 | 8124 | 3129 |  |
|  | 7442 | 7438 | 7435 | 7431 | 7428 | 7424 |  | 7417 | 74 | 2.7410 |  | 213 | 21 | 21 | 2154 | 218 | 2170 | 2178 | 2186 | 2194 |  |
|  | 65 |  |  |  |  |  |  | 6556 |  |  |  | 6174 | 6184 | 619 | 6206 | 62 | 62 | 62 | 624 | 6259 |  |
| 5 | 5736 | 5730 | 5724 | 5719 | 5713 | 5707 | 701 | 5695 | 5689 | 4.5683 |  | 0217 | 0230 | 24 | 0257 | 027 | 02 | 029 | 310 | 0324 |  |
| 6 | 48 | 4876 | 4869 | 4862 | 4855 | 4848 | 4841 | 4834 | 482 |  | ＊ 4245 | 4261 | 42 | 4293 | 4308 | 4324 | 4340 | 56 | 2 | 4388 |  |
|  | 4031 | 4023 | 401 | 4 |  |  |  |  | 3965 |  |  | 83 | 83 | 8341 | 8360 | 8379 |  | 8416 |  | 8453 |  |
|  | 317 | 3169 |  |  |  | 3131 | 3121 | 3112 | 310 |  | ， | 23 | 23 | 239 | 241 | 24 | 2454 | 2475 | 2496 | 2518 |  |
|  | 2325 | 2315 | 2304 | 2 |  | 22 | 2262 |  | 2240 | 8．2 | 3.6367 | 639 | 64 | 643 | 6463 | 6487 | 6511 | 6535 | 6558 |  |  |
| 10 | 14 |  |  |  |  |  |  | 1390 | 1378 | 9.1366 | 4.0408 | 0434 | 0461 | 0488 | 0514 | 0541 | 0567 | 0594 | 0621 | 647 | 10 |
| 11 | 062 | 0607 |  | 058 | 0568 | 0555 |  | 0529 | 0516 | 10 | 4.4449 | 4478 | 4507 | 4536 | 566 | 4595 | 4624 | 4653 | 4683 |  | 11 |
| 12 | 9767 | 975 | 97 | 97 |  |  |  |  |  |  |  | 85 | 85 |  | 8617 | 86 |  | 8713 | 8745 |  | 12 |
| 13 | 8914 | 889 |  |  |  | 8838 |  | 8807 | 8792 | 11.877 | 5.2531 | 2565 | 2599 | 2634 | 2668 | 27 |  |  | 2807 |  | 13 |
| 14 | 8061 | 8045 | 802 | 8012 | 7996 | 7979 | 7963 |  | 792 | 12 | $5 \cdot 657$ | 6608 | 66 | 6683 | 672 | 67 | 67 | 6832 | 68 | 690 | 14 |
| 15 | 720 | 719 | 717 |  |  | 7120 |  |  |  | 13.7050 | 6.0612 | 0652 |  | 0731 | 0771 | 08 | 08 | 0891 | 093 | 097 | 5 |
| 16 | 6356 | 6337 |  |  |  |  |  |  |  | 14．618 |  |  |  |  | 4823 |  |  |  |  |  | 16 |
| 17 | 5503 |  |  |  |  |  |  |  | 5343 |  |  |  |  |  |  |  |  | 9010 |  |  |  |
| 18 | 4650 | 4629 | 4608 | 45 | 4566 | 45 | 4523 | 4502 | 448 | 16.44 | $7 \cdot 273$ | 27 | 28 | 2878 | 2925 | 2973 | 3021 | 3069 | 3117 | 316 | 18 |
| 19 | 37 | 37 |  |  |  |  | 3663 | 3641 | 361 | 17.35 | 7.6775 | 68 | 68 | 6926 | 6977 | 7027 | 7078 | 7128 | 7179 |  | 19 |
| 20 | 2945 | 2921 | 2898 | 2874 | 28 | 2827 | 2804 | 2780 | 2756 | 18.273 | ． 0816 | 0869 | 0922 | 097 | 102 | 10 | 113 | 1188 | 1241 | 129 | 20 |
| 21 | 209 | 2068 | 2043 | 2018 | 1993 | 1969 | 1944 | 191 | 1894 | 19. | 3 485 | 4912 | 4968 | 502 | 508 | 5136 | 51 | 5247 | 5303 | 535 | 21 |
| 22 | 1239 | 121 |  |  |  | 1110 |  |  |  |  |  |  | 90 |  |  |  |  |  |  |  | 22 |
| 23 | 038 |  | 0333 |  | 0278 |  | 022 | 0197 | 017 |  |  |  |  | 312 | 3183 |  |  |  | 3427 |  | 23 |
| 24 | 953 |  | 947 |  |  |  |  |  |  | 21.92 | 9．69 |  | 710 | 717 | 72 | 72 | 7362 | 74 | 7489 | 75 | 24 |
| 25 | 86 | 865 |  |  |  |  |  |  |  | 22.8416 | 10．1019 | 1086 | 1152 | 12 | 12 | 1352 | 1418 | 48 | 1551 |  | 25 |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 697 | 6944 | 69 |  |  |  |  | 675 | 672 |  |  |  |  |  |  |  |  |  | 9675 |  | 27 |
| 28 | 61 |  |  |  |  | 5958 |  |  |  |  | 11.3142 | 32 | 32 |  |  |  |  | 3663 | 3737 | 38 | 28 |
| 29 | 52 | 5236 |  |  |  |  |  |  |  | 26.49 | $11 \cdot 7$ |  | 7337 | 741 |  | 75 | 7645 | 72 | 7799 |  | 析 |
| 30 | 4417 | 438 | 4347 | 43 | 4276 | 4241 | 4205 | 4170 | 413 | $27 \cdot 40$ | 12.122 | 1303 | 138 | 46 | 154 | 16 | 170 | 178 | 186 | 194 | 30 |
| 31 | 35 | 3528 | 3492 | 3455 | 3419 | 3382 | 3346 | 330 | 3272 | 28.323 | 12.52 | 5347 | 5429 | 551 | 559 | 5676 | 5759 | 5841 | 592 | 600 | 31 |
| 32 | 27 | 2674 |  |  |  | 2524 |  |  | 2410 | 29.23 | 12.93 |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 185 | 18 | 17 | 1743 | 1704 | 1665 | 1626 | 158 | 154 |  | $13 \cdot 33$ |  | 35 |  | 369 |  | 3872 | 39 | 404 |  | 33 |
| 34 | 10 |  |  |  |  | 08 |  |  |  |  |  |  | 756 |  |  |  | 7929 | 80 | 8110 |  | 34 |
| 35 | 015 |  |  |  |  |  |  |  |  | 31.9782 |  | 1520 | 1613 |  |  |  | 1986 | 2079 | 2172 |  | 35 |
| 36 | 930 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 36 |
| 37 | 844 | 840 | 836 | 83 |  |  |  |  |  |  |  |  |  |  |  |  |  | 0198 |  |  | 37 |
| 38 |  |  |  |  |  |  |  |  |  |  |  |  | 37 |  |  |  | 4156 | 42 |  |  | 38 |
| 39 | 674 |  |  |  |  | 65 |  |  |  |  |  |  |  |  | 80 |  | 213 | 831 | 2420 |  | 39 |
| 40 | 589 | 58 | 57 | 574 | 5702 | 5654 | 5607 | 5560 | 5513 | 36 | 16. | 173 | 18 | 195 | 20 | 21 | 226 | 237 | 2482 | 258 | 40 |
| 41 | 50 | 4989 | 4941 | 4892 | 4844 | 4796 |  |  | 465 | $37 \cdot 460$ | 16.5672 | 5781 |  |  |  |  | 6326 | 6435 |  |  | 41 |
| 42 | 418 | 4135 |  |  |  |  |  |  |  |  | 16.97 |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 333 | 328 | 32 | 318 |  | 30 |  | 297 |  |  | $17 \cdot 37$ |  |  |  |  |  |  | 455 | 46 |  | 43 |
| 4 | 24 | 24 | 237 |  |  | 22 |  |  |  | 40．20 |  |  |  | 81 |  |  |  | 86 |  |  | 44 |
| 45 | 1626 | 1573 | 152 |  | 1414 | 1361 |  |  |  | $41 \cdot 114$ | 18.1835 | 1955 | 2076 | 2194 | 2314 | 2433 | 2553 | 2673 | 2792 |  | 45 |
| 46 | 077 | 071 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
| 47 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 079 |  |  | 47 |
| 48 | 90 |  |  |  |  | 8785 |  |  |  | 43.85 | 19.395 |  | 42 |  |  |  |  | 48 |  |  | 48 |
| 49 | 821 |  | 81 |  |  | 7927 |  |  |  |  | 19 | 8128 | 82 | 838 | 85 | 8650 | 8780 | 8910 | 904 | 917 | 49 |
| 50 | 736 | 7304 | 724 |  | 71 |  | 700 | 6950 |  | 45.683 | 20．203 | 2172 | 230 |  | 259 | 704 | 233 | 2970 | 3103 | 37 | 50 |
| 51 | 6510 | 6450 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 52 |
| 53 | 480 | 47 | 46 |  |  | 449 |  |  | 43 | 48.42 |  |  | 444 | 45 |  |  |  |  | 52 |  |  |
| 54 | 39 |  |  |  |  | 3633 |  |  |  | 49.33 |  |  |  |  |  |  |  |  | 9381 |  | 54 |
| 55 | 3099 |  | 296 | 290 |  | 2775 | 27 |  | 258 | 50.2515 | 22：2243 |  | 2535 |  |  |  | 3120 | 3268 | 3413 |  | 55 |
| 56 | 224 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 138 | 153 |  | 57 |
| 58 | 05 | 04 |  |  |  |  |  |  |  | $52 \cdot 99$ |  |  |  |  |  |  |  |  |  |  | 58 |
| 59 | 968 |  |  |  |  |  | 92 |  |  |  | $23 \cdot 8$ | 85 | 87 | 88 | 903 | 91 | 93 | 950 | 96 | 98 | 59 |
| 60 | 8835 |  |  | 86 |  | 8482 |  |  |  | 54.8198 | 24.24 | 260 | 27 | 29 | 308 | 324 | 3404 |  | 372 |  | 60 |
| 61 | 7982 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 62 |
|  | 62 | 6203 |  |  |  |  | 583 | 57 | 56 | 56 | $25^{\circ} 4$ |  | 49 |  |  |  |  | 57 | 929 |  | 63 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 64 |
| 65 | 457 | 4495 |  | 434 |  | 4188 | 411 | 403 |  | 59.388 |  |  |  |  |  |  | 36 | 386 |  |  | 65 |
| 66 | 3718 | 364 |  |  |  | 333 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
|  |  |  |  |  |  |  |  | 23 | 22 | 61 | 27 |  |  |  |  |  |  |  |  |  | 67 |
|  | 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 68 |
| 69 | 1160 | 1079 |  | 09 | 0835 | 075 | 067 | 059 | 051 | 63.04 | 27•88 | 89 | 918 | 93 | 95 | 97 | 9815 | 109 | 0282 |  | 69 |
| 70 | 0307 | 225 |  |  | 9978 | 9895 | 9813 | 97 | 9647 | 63.956 | 28.28 | 30 | 3227 | 34 |  | 3785 | 397 | 4 | 4344 | 45 | 70 |
| 71 | 945 | 9371 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 71 |
| 72 | 8602 | 851 |  |  |  | 8178 |  |  |  |  |  |  |  |  |  |  |  | 276 |  |  | 72 |
|  | 7749 | 7663 | 75 | 7491 | 7405 | 73 | 7233 | 714 | 706 | 66．697 | 29.49 | 517 | 536 | 55 | 57 | 59 | 61 | 633 | 653 |  | 73 |
|  | 6896 | 析 |  |  |  | 6461 | 6373 |  |  |  |  | 921 | 9411 | 析 | 980 | ． |  |  |  |  | 74 |
| 75 | 604 | 5955 | 586 | 577 |  | 502 | 5514 | 5425 | 533 | 521 | 30．30 | 325 | 345 | 36 | 38 | 40 | 425 | 4454 | 465 |  | 75 |
|  | 5191 | 5101 | 5012 | 492 | 4833 | 4743 | 4654 | 456 | 447 | $69 \div 438$ |  | 73 | 750 | 770 |  | 81 | 8312 | 851 | 876 |  | 76 |
|  | 4338 | 230 |  |  |  |  |  |  | 36 | 35 | $31 \cdot 11$ |  | 15 | 17 | 195 | 21 |  | 25 | 27 |  | 77 |
| 78 | 3485 | 3394 |  |  |  |  |  |  |  |  |  |  |  | 585 |  | 621 |  | 683 |  |  | 78 |
| 79 | 2633 | 2540 | 2 | 2354 | 2261 | 2168 | 20 | 198 | 1888 | $72 \cdot 179$ | 31.922 | 9431 | 9642 | 985 | ＋062 | 0272 | 0482 | 069 | 090 | 11 | 79 |
| 80 | 1780 |  | 1592 |  |  |  |  | 172 | 1026 | 73．093 | 32－3262 | 3475 | 3688 | 390 | 41 |  | 4539 | 47 | 49 | 517 | 80 |
| 81 | 0927 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 81 |
|  | ＋07 | 997 | 988 | 97 |  | 9592 | 94 | 939 | 9301 |  |  | 15 | 178 | 198 | 2216 | 2434 | 2652 | 2870 | 3088 |  | 82 |
|  | 922 | 9124 | 9026 |  | 8831 | 8733 | 8635 | 853 | 8439 | $75 \cdot 83$ | 33．53 | 560 | 5826 | 60 | 62 | 6488 | 6709 | 693 | 715 |  | 83 |
|  | 836 | 8270 | 8171 | 80 |  |  |  |  |  |  |  | 9649 | 9872 | 109 | ， | 54 | 766 | 938 | 1212 |  | 84 |
| 85 | 75 | 7416 | 7316 | 721 | 16 | 7016 | 691 | 6815 | 6715 | 661 | 34.346 | 3692 | 3918 | 414 | 437 | 459 | 482 | 504 | 527 | 55 | 85 |
|  | 666 |  |  |  | 6258 | 6157 | 6056 | 595 | 5852 | $8 \cdot 57$ | 34 | 7735 | 796 | 819 | 84 | 8650 | 8879 | 910 | 933 |  | 86 |
|  | 581 | 585 | S60 |  |  | 298 | S136 |  | 499 | 79.48 | 35 | 1779 | 2010 | 224 | 2 | 2705 | 矿 | 316 | 339 |  | 87 |
| 88 | 495 | 485 | 475 | 464 | 4544 | 4440 | 4336 | 4232 | 412 |  |  | 582 | 6056 | 629 | 65 | 67 | 69 | 7227 | 矿 |  | 88 |
| 89 | 4105 | 4146 | 3896 | 391 |  |  |  | 337 | 3266 | 81.31 | 35.96 | 9866 | ＋103 | 033 | 05 | 08 | 1049 | 1286 | 1523 |  | 89 |
| 90 | 3252 | 3146 | 3041 | 2935 |  | 2722 | 2616 | 2510 | 226 | 82．2297 | 36：367 | 3909 | 4149 | 438 | 05 | 088 | 5106 | 5345 | 5585 | 1985 | 90 |
|  | 239 | 229 | 2185 | 2078 | 71 | 86 |  |  |  |  |  |  |  |  |  |  |  | 4 |  |  |  |
|  | 1547 |  |  |  | 14 | 1005 |  | 078 | 0679 | 84.057 | $37 \cdot 175$ | 1996 | 224 | 248 | 273 | 29 | 32 | 346 | 370 | 395 | 92 |
|  | 0694 | 0585 | 0475 | 0366 | 0256 | 0147 |  | 9927 | 9817 | 84．970 | 37.5792 | 6040 | 628 | 653 | 678 |  | 7276 | 752 | 777 |  | 93 |
| 94 | 984 | 9731 | 9620 |  | 9399 | 9288 | 9177 | 9066 | 8955 | 85.884 | 37.9833 | －083 | 0333 | 058 | 083 | 1083 | 1333 | 1583 | 183 |  | 94 |
| 95 | 898 | 887 | 8765 |  |  |  | 8317 | 8205 | 8093 | 86.798 | 38.3874 | 412 | 437 | 463 | 48 | 5137 | 539 | 5642 | 589 | 614 | 95 |
|  | 8136 | 81 |  | ｜7797 | 源 | 7 71 |  |  |  | 717 | $38 \cdot 79$ | 8170 | 8425 | 868 | 8936 | 912 | 4446 | 9702 | 9957 | ＋212 | 96 |
|  | 728 | 7169 | 7055 | 69 | 6826 | 6712 | 65 | 6483 | 6368 | 88.6254 |  | 2213 | 247 | 2729 | 293 | 3245 | 3503 | 376 | 4019 |  |  |
|  | 6430 | 6315 |  |  | 5969 | 5853 | 矿 | 5622 | 5506 | 89.5390 | 39＊59 | 6257 | 651 | 6778 | 703 | 729 | 矿 | 782 | 21 |  | 98 |
|  | 5577 |  |  |  |  | 4995 | 4878 | 4761 | 4644 |  |  | 300 | 561 | 0827 | 1090 | 353 | 1617 | 1880 | 2143 |  | 99 |
| 100 | 4725 | 4607 | 490 | ${ }^{3} 7$ | 4254 | 4136 | 6018 | 3900 | 3782 | 91.36 | 40\％4078 | 4344 | 4610 | 4876 | 5142 | 5408 | 5673 | 5939 | 6205 | 6471 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | 8 | $7^{\prime}$ | $6^{\prime \prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | ${ }^{\prime \prime}$ | \％ | $1{ }^{\prime}$ |  |  |  |  | $5^{\prime}$ | $4^{\prime}$ |  |  | $1^{1}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | sine |  |  |  |  |  |

TRAVERSE TABLES．

| $24^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $24^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | （1） | $l^{\prime}$ | $2^{\prime}$ | 3＇1 | $4^{\prime} 1$ | $5^{\prime}$ | 6 | 7 | $8^{\prime}$ | 9 | 0 | $1^{\prime}$ | 2 | $3^{\prime}$ | $4^{\prime}$ | $5^{\prime}$ | $6^{\prime}$ | $7{ }^{\prime}$ | $8^{\prime}$ | y |  |
|  | 9135 | 9134 | 9133 | 9132 | 9131 | 91 | 91 | 9127 | 9126 | 9125 |  | 4070 | 4073 | 4075 | 4078 | 4081 | 4083 | 4086 | 88 | 4091 |  |
| 2 | 8271 | 8269 | 8266 | 8264 | 8261 | 8259 | 8257 | 8254 | 8252 | 18250 | 35 | 8140 | 8145 | 8151 | 8156 | 8161 | 8167 | 8172 | 8177 | 8183 |  |
| 3 | 7406 | 7403 | 7399 | 7396 | 7392 | 7389 | 7385 | 7381 | 7378 | 27374 | 12202 | 2210 | 2218 | 2226 | 2234 | 2242 | 2250 | 2258 | 2266 | 2274 |  |
| 4 | 6542 | 6537 | 6532 | 6528 | 6523 | 6518 | 6513 | 6509 | 6504 | 3.6499 | －6269 | 628 | 6291 | 6301 | 6312 | 6323 | 6333 | 6344 | 6354 | 636 |  |
| 5 | 567 | 567 | 56 | 5660 | 565 | 5648 | 5642 | 36 | 5630 | 4.5624 | 2.0337 | 035 | 036 | 0377 | 039 | 0403 | 0417 | 0430 | 0443 | 045 | 5 |
| 6 | 4813 | 4806 | 4799 | 47 | 4784 | 477 | 47 | 476 | 4756 | 5.4749 | $2 \cdot 4404$ | 4420 | 4436 | 4452 | 4468 | 4484 | 0 | 6 | 2 | 4548 |  |
|  | 3948 | 3940 | 3932 | 3923 | 3915 |  | 3898 | 3890 | 3882 | 6.387 | 2＇8472 | 8490 | 8509 | 85 | 854 | 856 | 8583 | 22 | 8620 | 8639 |  |
| 8 | 3084 | 3074 | 3065 | 3055 | 3046 | 3036 | 3027 | 301 | 3008 | 7－2998 | ． 2539 | 256 | 258 | 2603 | 2624 |  | 2666 |  |  | 2730 |  |
|  | 2219 | 2208 | 2198 | 2187 | 2176 | 2166 | 2155 | 2144 | 2134 | 8.2123 | 3.6606 | 6630 | 665 | 6678 | 6702 | 672 | 67 | 6774 | 67 | 6821 | 9 |
| 10 | 1355 | 1343 | 1331 | 1319 | 1307 | 1295 | 1283 | 1272 | 126 | ． 1 | 4.06 | 0700 | 072 | 075 | 07 | 080 | 0833 | 0860 | 0886 | 3 | 10 |
| 11 | $\overline{0490}$ | 0477 | 0464 | 0451 | 04 | 04 | 0412 | 03 | 0386 | 10.03 | 4.4741 | 4770 | 47 | 4829 | 4858 | 488 | 491 | 4946 | 497 | 5004 | 11 |
| 12 | 9625 | 96 | 矿 | 9583 | 9569 | 9554 | 9540 | 952 | 9512 | 10．949 | 4．8808 | 88 | 8872 | 8904 | 8936 | 896 | 900 | 9032 | 9063 |  | 12 |
| 13 | 8761 | 8746 | 8730 | 8715 | 8699 | 8684 | 8668 | 8653 | 8638 | 11.862 | 5.2876 | 291 | 29 | 2979 | 30 | 3048 | 30 | 3117 | 31 | 3186 | 13 |
| 14 | 7896 |  | 78 | 7847 | 7830 | 7813 | 779 | 7780 | 7764 | 12.7747 | 5.6943 | 6980 | 7018 | 7055 | 7092 | 712 | 7166 | 7203 | 7241 |  | 14 |
| 15 | 7032 | 7014 | 6996 | 6979 | 6961 | 43 | 6925 | 6907 | 6889 | 13.6872 | 6.1010 | 1050 | 1090 | 1130 | 1170 | 1210 | 25 | 289 | 132 |  | 15 |
| 16 | 61 | 6148 | 61 | 6110 | 609 | 60 | 6053 | 60 | 60 | 14 | 6.5078 | 512 | 51 | 5205 | 524 | 5290 | 5333 | 75 | 5418 | 5460 | 16 |
| 17 | 5303 | 5283 | 5262 | 524 | 5222 | 5202 | 5182 | 5162 | 41 | 15．512 | 6.9145 | 9190 | 9236 | 9281 | 9326 | 9371 | 6 | 9461 | 5506 |  | 78 |
| 18 | 4438 | 1 | 4396 | 437 | 4353 | 4332 | 4310 | 4289 | 4267 | $16^{4} 424$ | 7.3213 | 3260 7330 | 3308 7381 | 3356 | 3404 | 3452 | 7583 | 763 | 768 |  | 19 |
| 19 | 3574 | 3551 | 3529 | 3506 | 348 | 3461 | 3438 | 3416 | 3393 | 17.337 | $7 \cdot 7280$ | 733 | 738 | 7431 | 748 | 75 | 7583 | 7633 | 17 | 7734 | 19 |
| 20 | 2709 | 2685 | 2662 | 2638 | 2614 | 2591 | 2567 | 2543 | 2519 | 18.2496 | 8.1347 | 140 | 14 | 15 | 156 | 16 | 1666 | 171 | 177 | 1825 | 20 |
| 21 | 18 |  | 1795 | 17 |  | 1720 | 1695 | 1670 | 45 | 162 | 8.5415 | 54 | 55 | 5582 | 563 | 56 | 98 | 58 | 59 | 5917 | 21 |
| 22 | 09 | 0954 | 092 |  | 0876 | 0850 | 0824 | 079 | 0771 | 20.0745 | 8.94 | 95 | 95 | 96 | 971 | 97 | 9833 | 989 | 995 | －008 | 22 |
| 23 | 0115 | 0088 | 006 | 003 | －006 | 9979 | 9952 | 9925 | 97 | 20.9870 | －3549 | 3611 | 3672 | 3733 | 379 | 38 | 6 | 397 | 40 | 40 | 23 |
| 24 | 9251 | 23 | 9194 |  | 137 | 109 | 9080 | 9052 | 9023 | 21.8995 | ， 1617 | 7681 | 77 | 7808 | 7872 | 79 | 7999 | 8063 | 818 |  | 24 |
| 25 | 838 | 37 | 18327 | 8298 | 268 | 238 | 8209 | 8179 | 8149 | 22．8119 | 10．1684 | 1751 | 18 | 1883 | 195 | 20 | 208 | 2149 | 221 | 2282 | 5 |
| 26 | 7522 | 91 | 7460 | 742 | 7399 | 7368 | 7337 | 73 | 7275 | 23•7244 | 10.5 | 58 | 5890 | 5959 | 6028 | 6097 | 6166 | 623 | 304 | 6373 | 26 |
| 27 | 665 | 6625 | 659 | 656 | 6529 | 6497 |  | 6433 | 6401 | 24 | 10 | 98 | 9962 | －034 | 010 | 01 | 0249 | 0321 | 0393 | 046 | 27 |
| 28 |  |  | 5726 | 569 | 5660 | 562 | 559 | 556 | 5527 | 25.549 | 11.38 | 396 | 4035 | 41 | 418 | 42 | 4333 | 4407 | 4481 |  | 28 |
| 29 | 4928 | 4894 | 4860 | 482 | 4791 | 475 | 47 | 468 | 4653 | 26.461 | 1179 | 8031 | 8108 | 818 | 8262 | 8339 | 841 |  | 85 | 8647 | 29 |
| 30 | 4064 | 4028 | 3993 | 3957 | 3921 | 3886 | 3850 | 3815 | 37 | 27 | 12 | 21 | 21 | 2260 | 23 | 24 | 2499 | 257 | 2658 | 2738 | 30 |
| 31 | 3199 | 3162 | 3126 | 3089 | 3052 | 3015 | 2979 |  |  | 28.28 | 12.608 | 617 | 6253 | 6335 | 64 | 0561 | 6582 | 075 | 6747 | 6829 | 31 |
| 32 | 2335 | 229 | 225 | 2 | 2183 | 2145 | 2107 |  | 2031 | $29 \cdot 19$ | 13.01 | 02 |  | 0411 | 049 | 05 | 0666 | 07 | 0836 | 092 | 32 |
| 33 | 147 | 1431 | 139 | 13 | 1314 | 1274 | 235 | 1196 | 1157 | $30 \cdot 1118$ | $13 \cdot 422$ | 4311 | 43 | 448 | 45 | 466 | 4749 | 4837 | 4924 | 5012 | 33 |
| 34 | 0605 |  | 05 | 85 |  | 0404 | 0364 | O323 | 0283 | 31.02 | 13.829 | 8381 | 84 | 8561 | 86 | 8742 | 8832 | 8923 | 9013 | 10 | 34 |
| 35 | 97 |  | 965 | 9617 | 9575 | 9534 | 9492 | 9450 | 9409 | 31.93 | 14.235 | 2451 | 254 | 263 | 273 | 2823 | 291 | 3009 | 3102 | 3194 | 35 |
| 36 | 8876 | 883 | 879 | 8748 | ${ }^{8706}$ | 8663 | 8620 | 8578 | 8535 | 32 | 14 | 65 | 6617 | 6712 | 6808 | 6903 | 6999 | 7095 | 7190 | 7286 | 36 |
| 37 | 8012 | 7968 | 79 |  | 7836 | 77 | 7749 | 7705 | 7661 | 33 | 15. | 059 | 0689 | 0787 | 0886 | 0984 | 1082 | 1181 | 1279 | 377 | 37 |
| 38 | 7147 | 7102 | 705 | 7012 | 6967 | 6922 | 6877 | 6832 | 6787 | 34．674 | 15.45 | 46 | 476 | 486 | 49 | 5065 | 5166 | 5266 |  |  | 38 |
| 39 | 6283 | 6237 | 619 | 6144 | 6098 | 6052 | 6005 | 5959 | 5913 | $35 \cdot 58$ | 15.86 | 87 | 883 | 893 | 90 | 9145 | 924 | 935 | 9456 | 9559 | 39 |
| 40 | 5418 | 5371 | 5323 | 5276 | 5229 | 51 | 513 | 5086 | 5039 | 36. | 16.2695 | 2801 | 907 | 301 | 3120 | 322 | 333 | 3438 | 354 | 65 | 10 |
| 41 | 4554 | 4505 | 4457 | 4408 | ${ }^{4359}$ | 4311 | 4262 | 4213 | 4165 | $37 \cdot 4116$ | 16.67 | 6871 | 6980 | 708 | 71 | 7307 |  | 75 | 7633 |  | 41 |
| 42 | 368 | 3639 | 359 | 3540 | 3490 | 3470 | 3390 | 3340 | 3291 | 38.3241 | 17.08 |  |  |  | 12 | 13 | 149 | 16 | 1722 |  | 2 |
| 43 | 282 | 277 | 272 | 2672 | 2621 | 25 | 2519 | 2468 | 2416 | $39 \cdot 2365$ | 17.489 | 5011 | 51 | 523 | 535 | 5468 | 5582 | 56 | 5810 | 5925 | 43 |
| 44 | 1960 | 1908 | 1856 | 04 | 52 | 1699 | 1647 | 1595 | 542 | 40．149 | 17．896 | 9081 | 91 | 931 | 943 | 95 | 966 |  | 9899 |  | 4.4 |
| 45 | 10 | 1042 | 098 | 析 |  | 082 | 0775 | 0722 |  | 41.0615 | 18.303 | 3151 | 327 | 339 | 35 | 362 | 37 | 3868 | 3988 | 4107 | 45 |
| 46 | 0231 | 0176 | 012 | 0067 | ＋013 | 99 |  | 19849 |  | 41.9740 | 18. | 72 | 7343 | 7466 | 7588 | 7710 | 7832 | 7954 |  |  | 46 |
| 47 | 9366 | 931 | 92 | 9199 | 9144 | 0 | 9032 | 8976 | 8920 | 42.8864 | 19.11 | 129 | 1416 | 15 | 168 | 179 | 1915 | 2040 | 2165 | 2290 | 47 |
| 48 | 850 | 8445 | 8388 | 31 | 74 | 821 | 160 | 8103 | 8046 | 43.7 | 19.5 | 5361 | 5489 | 561 | 57 | 587 | 598 |  |  |  | 48 |
| 49 | 7637 | 75 |  |  |  | 73 |  |  |  | 44.7 | 19.93 | 9431 | 9561 | 969 | 9822 | 995 | ＋08 | 02 | 034 | 047 | 49 |
| 50 | 6773 | 6714 | 66 | 95 | 6536 | 6476 | 417 | 6358 | 6298 | $45 \cdot 6239$ | 20 | 3501 | 3634 | 3767 | 3900 | 403 | 416 | 429 | 443 | 45 | 50 |
| 51 | 59 | 584 | 5787 | 5727 | 5667 | 5606 | 5545 | 5485 | 5424 | 46 | 20 | 7571 | 7707 | 7842 | 797 | 8113 |  | 8384 |  | 865 | 5 |
| 52 | 504 | 4982 | 4921 | 359 | 4797 | 4736 | 4674 | 4612 | 4550 | 47.4888 | 21.150 | 16 | 17 | 19 | 20 | 219 |  | 2470 |  |  | 52 |
| 53 | 417 | 4116 | 4054 |  | 3928 | 3865 | 3802 | 3739 | 3676 | 48.3613 | 21.557 | 5711 | 585 | 5993 | 61 | 6274 | 64 | 65 | 667 | 6837 | 53 |
| 54 | 3315 | 3251 | 31 | 3123 |  | 2995 | 30 | 366 | 2802 | 49.2738 | 21.963 | 9781 | 992 | ＋06 | 02 | 035 | 049 | 06 | 078 | 092 | 54 |
| 55 | 24 | 238 | 232 | 2255 | 2189 | 212 | 2059 | ， | 1928 | 50．1863 | 22.3705 | 3851 | 仡 |  | 4290 | 4436 | 458 | 472 | 97 | 5020 | 55 |
| 56 | 15 | 151 | 1453 |  | 1320 | 125 | 187 | 1121 | 1054 | 51.0987 | $22 \cdot 7772$ | 792 | 8070 | 82 |  |  | 366 |  |  |  | 56 |
| 57 | 07 | 065 |  | 0518 | 0451 | 0383 | 15 |  | 0180 | 52.0112 | $23 \cdot 1840$ | 1991 |  | 229 | 2446 | 2597 | 274 | 29 | 3051 | 3202 | 57 |
| 58 | 98 | 97 | 9719 | 9650 | 9582 | 951 | 9444 | 9375 | 9306 | 52.923 | $23 \cdot 59$ | 606 | 6215 | 63 | 6524 | 667 |  |  |  |  | 58 |
| 59 | 8992 | 89 | 885 |  |  | 86 | 8572 |  | 8432 | 53.83 | 23.99 | ＋13 | 028 | 044 | 0602 | 0758 | 091 | 1072 | 1228 | 138 | 59 |
| 60 | 8127 | 8056 | 7985 | 79 | 7843 | 771 | 7701 | 7629 | 7558 | 54．7487 | $24 \cdot 40$ | 20 | 436 | 452 | 468 | 483 | 499 | 515 | 531 | 547 | 60 |
| 61 | 7263 | 7191 | 7118 |  | 6974 |  | 6829 |  | 6684 | 55.6611 | 24.8109 | 8271 |  | 261 |  | 800 |  | 9244 |  |  | 61 |
| 62 | 63 | 6325 | 6251 | 6178 | 6104 | 6031 | 5957 | 5884 | 5810 | 56.573 | $25^{\circ} 217$ | 23 |  | 267 | 2836 | 3000 | 316 | 33 | 3494 | 750 | 62 |
| 63 | 553 | 545 | 5384 | 5310 | 523 | 5160 | 5086 | 5011 | 4936 | 57.486 | $25^{\prime} 62$ | 6412 |  |  | 6914 |  |  | 7415 | 58 |  | 63 |
| 64 |  |  | 4518 |  | 4366 | 4290 | 14 | 138 | 4062 | 58.398 | 26.03 | 0482 | 065 | 082 | 0992 | 1162 | 13 | 1501 | 167 |  | 64 |
| 65 | 380 | 372 | 3651 | 3574 | 349 | 341 | 3342 | 3265 | 318 | 59.3110 | $26 \cdot 437$ | 4552 | 4724 | 4897 | S | 5242 | 5415 | 587 | 5760 | ｜ 5932 | 65 |
| 66 | 2940 | 28 | 2784 | 2706 | 262 | 254 | 2471 | 235 | 2314 | 60＇22 | $26 \cdot 8446$ | 8622 |  | 8972 | 9148 | 9323 | 949 | 9673 |  |  | 66 |
| 67 | 2075 | 1996 | 1917 | 1837 | 175 |  |  |  | 1440 | $61 / 13$ |  |  |  | 304 | 3226 | 3403 |  | 3759 | 3937 |  | 67 |
| 68 | 121 | 1130 | 1050 | 0969 | 0889 | 0808 | 0727 | 0646 | 0566 | 62.048 | $27 \cdot 65$ | 676 | 1015 | 71 | 7304 | 748 |  |  | 211 |  | 68 |
| 69 | 0346 | 026 | 0183 | 0101 | ＋019 | 9938 | 56 | 9774 | 9692 | 62.960 | 28.0648 | 083 | 1015 | 128 | 1382 | ＋56 | 748 | 631 | 118 |  | 69 |
| 70 | 9482 | 9399 | 9316 | 9233 | 9150 | 9067 | 8984 | 8901 | 8818 | $63 \cdot 8734$ | 28.4716 | 4902 | 508 | 527 | 546 | 56 | 583 | 601 | 620 | 638 | 70 |
| 71 | 8617 | 85 |  |  | 8 |  | 81 |  |  | 64.7 | 28.878 | 301 | ， | 仡 | 9538 | 926 |  | ＋103 | 0292 |  | 71 |
| 72 | 775 | 766 | 7582 | 7497 | 741 | 7326 | 7241 | 7155 | 7069 | $65 \cdot 6984$ | 29.2850 | 3042 | 3233 | 3424 | 3615 | 3807 | 399 | 4189 | 438 | 457 | 72 |
| 73 | 6888 | 6802 | 6715 | 6629 | 6542 | 6456 | 6369 | 6282 | 6195 | 66.610 | $29 \cdot 691$ | 7112 | 7306 | 7500 | 7693 | 7887 | 80 | 8275 | 346 | 866 | 73 |
| 74 | 2024 | 5936 |  | 5761 |  | 5585 | 5497 | 540 | 5321 | 67.523 | 30.098 | 1182 | 1378 | 157 | 1771 | 1968 | 216 | 236 | 255 | 275 | 74 |
| 75 | 5159 | 5070 | 4982 | 4893 | 480 | 4715 | 4626 | 453 | 444 | 68.4358 | $30 \cdot 50$ | 525 | 54 | 56 | 58 | 6049 | 6248 | 6447 | 6646 | 68 | 75 |
| 76 | 4295 | 4205 | 15 | 4025 | 3934 | 3844 | 3754 | 3664 | 3573 | 69．3483 | 30.912 | 9322 | 9524 | 9726 | 9927 | 129 | 331 | 533 | 寿35 | 59 | 76 |
| 77 | 3430 | 3339 | 3248 | 156 | 3065 | 297 | 2882 | 2791 | 2699 | $70 \cdot 260$ | 31.318 | 339 | 5 | 380 | 4005 | 421 | 4412 | 4619 | 4823 | 502 | 77 |
| 78 | 2565 | 2473 | 2381 | ， | 2196 | 2103 | 2011 | 1918 | 1825 | 71.1732 | $31 \cdot 7255$ | 7462 | 766 | 7876 | 8083 | 8291 | 849 | 8705 | 891 | 91 | 78 |
| 79 | 1701 | 1607 | 1514 | 20 | 1327 | 1233 | 139 | 104 | 0951 | 72.0857 | 32．1322 | 1532 | 1742 | 1952 | 2161 | 2371 | 258 | 2791 | 300 |  | 79 |
| 80 | 0836 | 0742 | 0647 | 0552 | 10457 | 0362 | 0267 | 0172 | 1077 | 72.9982 | $32 \cdot 53$ | 5602 | 58 | 6027 | 6239 | 645 | 666 | 687 | 708 | 330 | 80 |
| 81 | 9972 | 9876 | 9780 |  | 9588 | 92 | 9396 |  | 9203 | 73.9107 | 32．9 | 967 | 硡 | ， 1 | 0317 | 0533 | 074 | 0963 | 呥 | 5 | 81 |
| 82 | 9107 | 9010 | 13 | 8816 | 8719 | 8621 | 8524 | 8427 | 8329 | 74．8232 | 33：3524 | 3742 | 396 | 4178 | 4395 | 4613 | 483 | 5049 | 5266 | 548 | 32 |
| 83 | 8243 | 8144 | 8046 | 7948 | 784 | 7751 | 7652 | 7554 | 7455 | $75 \cdot 7356$ | $33 \cdot 75$ | 7812 | 8033 | 8253 | 8473 | 8694 | 891 | 9135 | 935 | 957 | 83 |
| 84 | 7378 | 278 | 寿 |  | 6980 | 6880 | 6781 | 6681 | 6581 | 76.6481 | 34．1659 | 1882 | 2105 | 2328 | 2551 | 2775 | 299 | 3221 | 3444 | 366 | 84 |
| 85 | 651 | 6413 | 6312 | 6212 | 611 | 6010 | 590 | 580 | 5707 | $77 \cdot 5606$ | 34.5726 | 595 | 617 | 6404 | 6629 | 6855 | 7081 | 7307 |  | 7758 | 35 |
| 86 | 5649 | 5547 | 45 | 534 | 5242 | 5139 | 537 | 493 | 4833 | $78^{\circ} 4731$ | 34．979 | －022 | 0251 | 045 | 070 | 5916 |  | 1379 | 5710 |  |  |
| 87 | 4785 | 4682 | 4579 | 4475 | 4372 | 4269 | 4166 | 406 | 3959 | 79．3855 | $35 \cdot 3861$ | 409 | 4323 | 455 | 4785 | 501 | S248 | 547 | 5710 | 920 | 87 |
| 88 | 392 | 3816 | 3712 | 3607 | 3503 | 3399 | 3294 | 3190 | 3085 | $80 \cdot 2980$ | 35.7928 | 816 | 839 | 8630 | 8863 | 9097 | 933 | 9564 | 9798 | －03 | 88 |
| 89 | 305 | 2950 | 28 | 2739 | 2634 | 2528 | 2422 | 2317 | 2211 | $81 \cdot 2105$ | $36 \cdot 1996$ | 2232 | 2469 | 2705 | 2941 | 3178 | 341 | 3650 | 388 | 412 | 8 |
| 90 | 2191 | 2084 | 978 | 87 | 1764 | 1658 | 1551 | 1444 | 1337 | 82．1230 | $36 \cdot 6063$ | 6302 | 6541 | 6780 | 7019 | 725 | 749 | 773 | 7975 | 821 | 90 |
| 91 | 132 | 1219 | 120 | 0135 | －802 | 9917 | 9807 | 0571 | 0463 | 83.035 | 37．013 | 0372 | 061 | 085 | 1097 | 54 | 158 | 1822 | 2064 | ${ }^{230}$ | 91 |
| 92 | 0462 | 0353 | 0244 | 0135 | ＋026 | 9917 | 9807 | 9698 | 9589 | 83.9479 | $37 \cdot 4198$ | 4442 | 4687 | 4931 | 5175 | 542 | 566 | 5908 | 6153 | 6397 | 2 |
| 93 | 9597 | 9487 | 9377 | 9267 | 9157 | 9046 | 8936 | 8825 | 8715 | 84.8604 | 37－8265 | 0512 | 8759 | 9006 | 9253 | 9500 | 974 | 9994 | 1241 | 4878 | 9 |
| 94 | 8733 | 8621 | 8510 | 8399 | 8287 | 8176 | 8064 | 7952 | 7841 | $85 \cdot 7729$ | 38.2332 | 2582 | 2832 | 3082 | 3331 | 358 | 383 | 4080 | 4330 | 457 | 94 |
| 95 | 7868 | 7756 | 7643 | 7531． | 7418 | 7305 | 192 | 7080 | 6967 | －6854 | 38.640 | 6652 | 6905 | 71 | 7409 | 766 | 791 | 8166 | 8418 | 867 | 95 |
|  | 7004 | 6890 | 6776 | 6663 | 6549 | 35 | 632！ | 6207 | 6093 | 87.597 | 39．046 | 年2 | 577 | 123 | 55 | 74 | 997 | 225 | 2507 | 276 | 96 |
|  | 6139 | 6024 | 5909 | 5794 | 5679 | 5564 | 54 | 53 | 52 | 88.5103 | 39.4535 | 479 | 5050 | 5308 | 5565 | 582 | 6081 | 63 | 6596 | 685 |  |
| 98 | 5275 | 5159 | 5043 | 4926 | 4810 | 4694 | 4578 | 4461 | 4345 | 89.4228 | 39.8602 | 8862 | 9123 | 9383 | 9643 | 9904 | ＋164 | 04 | 068 | 094 | 98 |
| 99 | 4410 | 4293 | 4176 | 4058 | 3941 | 3823 | 3706 | 3588 | 3471 | 90.3353 | 40.2669 | 2932 | 3195 | 3458 | 3721 | 3984 | 4247 | 45 | 896 | 5036 |  |
| 100 | 3546 | 27 | 3309 | 3190 | 3072 | 2953 | 2834 | 2715 | 2597 | 91：2478 | $40 \cdot 6737$ | 7002 | 7268 | 7534 | 7799 | 8065 | 8331 | 8596 | 3862 | 9127 | 100 |
|  | 60 | $5{ }^{\prime}$ | 58 | 57 | 56 | 55 | $54^{\prime}$ | 53 | 52 | 51 | $6{ }^{\prime}$ | 59＇ | $58^{\prime}$ | $57^{1}$ | 56 | $55^{\prime}$ | $54^{\prime}$ | $53^{\prime}$ | 52 | $51^{1}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $5^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $24^{\circ}$ Cosine． |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4 | 4131 | 134 | 4136 | 4139 | ${ }^{4142}$ |  |  |
|  |  |  |  | ${ }^{3216}$ |  | $1 \begin{aligned} & 8211 \\ & 73\end{aligned}$ | ${ }_{7313}^{8209}$ | ${ }_{7310}^{8206}$ |  | ${ }_{\text {l }}^{1.7322}$ | 61 | ${ }^{82469}$ | ${ }^{8251}$ | ${ }_{2385}^{8257}$ | 293 | ${ }_{240}^{2267}$ | 273 | 8278 |  |  |  |
|  |  | ${ }_{6}^{6442}$ | ${ }^{66377}$ |  | 2 | ${ }_{5528}^{6423}$ | 6418 | ${ }_{5516}^{664}$ | $\begin{gathered} 6400 \\ 5550 \end{gathered}$ |  | 1.6482 | 6492 | $\begin{array}{\|c} \substack{2503 \\ 05020} \end{array}$ |  | ¢524 |  | 45 | 5565 | 2708 |  |  |
|  |  |  | $\begin{aligned} & 4.0455 \\ & \hline 37755 \end{aligned}$ | $\begin{aligned} & \substack{4648 \\ \hline 6756 \\ 3756} \end{aligned}$ | 464 | $10.1034640$ |  | 4619 |  |  |  | 4739 | 4754 | 4770 | 14786 | 4882 | 4818 | 4834 | 4850 | 486 |  |
|  |  | ${ }^{3784}$ | ${ }_{2874}^{3785}$ | ${ }^{3856}$ | ${ }_{2855}^{3748}$ | 5 | ${ }_{2}^{3835}$ | 2826 |  |  |  |  | ${ }_{3006}^{8880}$ | 3899 | ${ }_{3048}^{89,7}$ |  | ${ }_{3094}^{8954}$ | 8973 |  |  |  |
|  |  |  | 1983 | （1972 |  | 1955 <br> 1056 | 1940 |  | 1918 |  |  | 71281 | 7132 <br> 125 | 7156 1284 |  | ${ }_{137}^{273}$ | ${ }^{1363}$ | 1390 |  |  |  |
|  | 110228 | ${ }_{0325}^{0215}$ | ${ }^{0202}$ | ${ }^{01888}$ | ${ }^{0} 178$ | ${ }^{10} 162$ | － 11.49 | ${ }^{0136}$ | ${ }^{0122}$ |  | 4.5325 | 5354 | 5383 | 5412 | 5441 | 547 | 5500 | 529 | 5558 |  |  |
|  |  |  | ${ }_{8420}^{937}$ | 8294 | ${ }_{8389}^{928}$ |  | ${ }_{838} 923$ | ${ }_{8342} 9$ | ${ }_{8326}^{9224}$ |  | ${ }_{4}^{4.934565}$ |  | 950 | 9546 |  |  |  |  |  |  |  |
|  | 147563 | 7546 | 7529 | 7513 |  | 7479 | 7462 | 7445 | 7428 | 12.7 | 576 | 7723 | 7760 | 7798 | 835 | 787 | 90 | 794 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 6．1887 |  |  | 1926 |  |  | 2045 |  |  |  |  |
|  | 788898 | 5 | ${ }_{485}^{5748}$ | ${ }^{5837}$ | 6 | 9 | ${ }_{4775}^{5671}$ | ${ }^{5655}$ | 5 |  | 6．5927 | ${ }_{0}^{5970}$ | \％138 | 6054 | ${ }_{0}^{6298}$ | 6139 | ${ }_{0}^{6181}$ | ${ }_{0363}^{6224}$ | －${ }_{0}^{6268}$ |  |  |
| 18 |  |  |  | 3345 |  | 3901 | 3880 |  |  |  | － |  | 4263 | 4311 | $\begin{aligned} & 4359 \\ & \hline 4025 \end{aligned}$ |  | 4454 | 4502 | 4 |  |  |
|  | 20 ${ }^{2323}$ |  | ${ }_{2185}^{3076}$ | ${ }_{2161}^{3053}$ | 2030 | 1113 | 2984 | 2065 | 2040 |  |  | 2362 | ${ }_{2515}^{8389}$ | ${ }^{2456}$ | 8890 |  |  |  |  |  |  |
|  | 1344 | 1319 | 1294 | 1269 | ${ }^{1244}$ | 1218 | 1193 | 1168 | 1143 | $19 \cdot 117$ | 8.6529 | 5585 | 6641 | ${ }^{6966}$ | 6752 | 6808 | 6883 |  |  |  |  |
| ${ }_{23}^{22}$ | 04568 |  | ${ }^{0.4203}$ | 9485 | 5 | ${ }_{\text {a }}^{430}$ | 9402 | ${ }^{02374}$ | －2945 |  | 9．0．470 | ${ }_{483}^{0788}$ | ${ }^{0} 9786$ | 0825 | 5014 | 507 | 1000 | 105 |  |  |  |
|  |  |  | $\begin{aligned} & 8,522 \\ & 78721 \end{aligned}$ | 8593 | 8564 |  | 8506 |  |  |  |  |  |  |  |  | 523 |  |  |  |  |  |
|  |  |  | 7331 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 66903 | 687 | 6840 | 680 | 6778 | ${ }^{674}$ | 5715 | 6684 | 65 | ${ }^{23.662}$ |  |  |  |  | 207 |  |  |  |  |  |  |
| 28 | ${ }^{2} 8126$ | 5092 | 5059 | 5025 | ${ }_{4995}^{5885}$ | 4958 | ${ }_{4924}^{5820}$ | 5889 | ${ }_{4855}^{5755}$ | 25. |  |  | ${ }_{552}^{139}$ | ${ }_{5595}^{1467}$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 4029 |  |  |  |  |  | 64 |  | 980 | ${ }_{987}^{5943}$ | ${ }_{995}^{5915}$ | 283 | ${ }^{596}$ |  |  |
|  |  |  |  |  |  |  | 3133 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1212061 | ${ }_{1534}^{2424}$ | 2386 | ${ }_{1457}^{2349}$ | 2 | 1380 | ${ }_{1342}^{237}$ |  |  |  |  | ${ }^{816}$ | ${ }_{2024}^{7898}$ | 2108 | 10.93 | 2788 | ${ }_{233}^{827}$ | 8309 |  |  |  |
| 33 | 30684 | 0644 | 060 | 0565 | 6 | 04 | 0446 | 0407 | 0367 | $30^{\circ}$ | $13: 5$ | 6062 | 6150 | 6237 | 324 | 6412 | 6499 | 6587 | 6674 |  |  |
| 34 <br> 35 |  | 885 | 882 | 8781 | ${ }_{873}^{963}$ | 8697 | 8655 | 8613 | ${ }_{8571}$ | ${ }_{31} 31.8$ | ${ }^{14} 14.0295$ | 2185 | 0275 | 449 | 458 | 0546 | 0636 | 486 | ${ }^{0816}$ |  |  |
|  | 680 | 797 | 793 | 7889 | 46 | 7803 | 180 | ， | 7673 |  | 14.8336 | ${ }^{8431}$ | ${ }^{8527}$ | 8622 | 8718 | ${ }^{8813}$ | 8908 | 9004 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 39 | ${ }^{\text {c }}$ | 53 | 5251 | 5 | － 6160 | 6014 | 5983 | 5026 | 4970 |  |  | 6678 | 070 |  |  |  |  |  |  |  |  |
| 40 |  | 4418 | 硅 | 432 | 4273 | 2225 | 417 | 4129 | 4081 | 35 | ${ }_{16.4818}^{1081}$ |  |  | 5136 |  |  |  |  |  |  |  |
|  | ${ }^{12} 3578$ | ${ }^{3528}$ | 3479 | ${ }^{3,330}$ | ${ }^{3388}$ | ${ }^{333}$ | ${ }^{3282}$ | ${ }^{3232}$ | ${ }^{3183}$ | 37．3134 |  | ${ }^{9047}$ | 9156 | ${ }^{9264}$ |  |  | 90 | 3838 |  |  |  |
| 43 | ${ }^{2} 1880$ | 1749 | ${ }^{259}$ | 1546 | ${ }_{154}^{2487}$ | ${ }_{1542}^{243}$ | ${ }_{1491}^{2381}$ | ${ }_{143}^{236}$ | ${ }_{138}^{2285}$ | 139. | ${ }_{17}^{1773179}$ | ${ }_{7293} 7$ | ${ }_{7407}^{3287}$ | 7521 | ${ }_{7635}^{3704}$ | 774 | ${ }_{783}^{3726}$ |  | ${ }^{3999}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 1416 | 1533 | 164 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 5659 |  | 589 |  |  |  |  |  |  |
|  | $6{ }^{81837}$ | 9080 | ${ }^{9} 823$ |  | 8 | 7965 | ${ }^{880}$ | 8788 | 7795 | 428738 | 18.95 | ${ }^{9662}$ | 9784 | 9906 | ${ }^{\circ} 2$ | 0150 |  | ${ }^{0394}$ | 515 |  |  |
| 48 | ${ }^{8} 7359$ | 7301 | 724 | 7186 | 7128 | 7070 | 7013 | 6955 | 6897 | ${ }_{43}^{4} 8839$ | 197781 | 7809 |  | ${ }^{4035}$ | ${ }_{8290}^{48}$ | ${ }_{847}^{4884}$ | ${ }_{8544}^{4808}$ | ${ }_{8672}^{433}$ |  |  |  |
|  | ${ }^{5} 5882$ |  | 6333 | 62 | ${ }_{5342}^{623}$ | 6176 | 617 | 6058 | 51501 | ${ }_{45}^{44} 5459404$ |  | 6155 | ${ }_{628}^{2162}$ | 6420 |  | 6685 | 681 |  | 7082 |  |  |
|  | 14693 | 4632 | 4571 | 4510 | 4449 | 4387 | 4326 | ${ }^{4265}$ | 42 |  |  | 0278 | 0413 | 0548 |  | 2 |  |  |  |  |  |
| 53 | 53297 | 2835 | 2780 | 37 | 258 | 2599 | 2535 | ${ }^{23671}$ | ${ }_{260}^{3205}$ | ${ }_{48} 4$ | 21．8384 | ${ }_{8524}$ | 8364 | 8805 | ${ }_{89} 89$ | ${ }^{2085}$ | 3026 | 5326 |  |  |  |
| 54 | 5202 |  |  |  | 1769 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 51140 |  |  | 942 | 0876 | 0810 | 744 | 678 |  | 0．05 | 22.66 |  | 691 |  |  |  |  |  |  |  |  |
|  | 252 | 0185 | 017 | ＋050 | 9983 | 9916 | 9848 | 9781 | 971 |  |  | 0883 | 1042 | 119 | ${ }^{1338}$ | ${ }^{1487}$ | 1635 | 1783 | ${ }^{132}$ |  |  |
| 58 | ${ }^{184} 8$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 59 | 97587 |  |  |  |  |  | 161 |  | 701 |  |  | 233 | 3415 | 3575 | ， | 388 | 4044 |  |  |  |  |
|  | 15810 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 4624 | 4549 | 445 |  |  |  |  |  |  |  |  |  |  |  | 6782 |  |  |
| ${ }_{6} 6$ | ${ }^{3} 143$ |  | 3882 | 3806 | 3738 | 3055 |  | 3503 | 3428 | 57．3 | 25：9588 | 9755 | 9922 | 088， | 0236 |  |  |  | 0923 |  |  |
| 5 | 52256 | 1188 | 2100 | 2 | 矿 | 1886 | 1788 | 2010 |  |  | 26.7829 |  |  |  | ${ }^{4581}$ | ${ }_{869} 8$ | ${ }_{886} 8$ | 9034 |  |  |  |
|  | 8 | ${ }^{12899}$ | ${ }^{1210}$ | ${ }^{1133} ⿱ 231$ | \％ | ${ }^{0972}$ | ${ }^{0993}$ | ${ }^{0817}$ | ${ }_{9836}^{0736}$ | ${ }^{60}{ }^{6}$ | ${ }^{2771949}$ | ${ }^{2124}$ |  | ${ }^{2474}{ }_{602}$ | ${ }^{2649}$ | 24 |  | 12 |  |  |  |
| 68 | ${ }^{959}$ | 9510 | 9428 | 9347 | 9265 | 9183 | 9101 | 9020 | 8938 | $61 \%$ | $28 \cdot 0190$ | 0371 | 0551 | ${ }_{071}$ | 0911 | 109 | 1271 | 1451 | 1631 |  | 68 |
| 69 |  | 7731 | ${ }_{764}^{8537}$ | 7563 | ${ }_{7479}^{8372}$ | 7394 | 7310 | ${ }_{7226}^{8123}$ | ${ }_{1}^{8040} 8$ | ${ }_{6}^{62} 77$ |  | ${ }_{8517}^{4494}$ | 802 |  |  |  |  |  |  |  |  |
|  | 16926 | 681 | 6756 | 677 | 6585 | 6500 | 6415 | 6329 | 224 |  | 29 | 2740 | 2928 | 3116 | 3304 | 3492 | 3680 | 3868 | 4056 |  |  |
| 72 | （2） |  |  |  |  |  | 551 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 74 | 4261 | 4172 | 4084 | 3995 | 3306 | 3817 | 3728 | 3639 | 355 | 673 | ${ }^{30}$ | 5109 | 5305 | 5501 | ${ }_{5697}$ | 5893 | 6039 | ${ }_{6285}^{248}$ | 6481 |  |  |
| 75 |  |  |  | 3103 |  |  |  |  |  | 68.2 | 30：9033 |  | 9431 | 9630 | 9828 | ${ }^{4} 227$ |  | 0424 | 0623 |  |  |
|  | ${ }_{1596}^{2484}$ | ${ }^{23}$ | ${ }^{2302}$ | ${ }_{131}^{221}$ | ${ }_{1220}^{2120}$ | ${ }^{2028}$ | 1937 | 1845 |  |  | 31．3154 | 3355 | 7357 | 3758 | 33959 | 1461 | ${ }^{4362}$ | ${ }^{4563}$ | ${ }_{88964}^{4764}$ |  | 76 |
| 78 | 0708 | S | 0521 | 0427 | 0333 | 0240 | 0146 | P052 | 9958 |  | ${ }^{321} 17395$ | 1601 | 1888 | 2015 | 222 | ${ }_{2428}$ | 2635 |  |  |  |  |
|  | 998819 |  |  |  |  | 9345 |  | 9155 |  |  | $32: 5515$ | 5725 | 0 | 6143 | 6352 | 6562 | 6771 |  |  |  |  |
|  | 18843 | 7945 | 7848 | 7751 |  |  | 7459 |  |  |  |  | 3971 | 4185 |  |  |  |  |  |  |  |  |
|  | 217 7154 |  |  | 6859 |  |  |  |  |  |  |  | 8994 |  | 8528 |  |  |  |  |  |  |  |
| ${ }_{84} 8$ | ${ }_{5}{ }_{5}^{62}$ |  | 5178 | 5075 | 4974 | ${ }_{4873}$ | 4772 | 4681 | 4570 | 75.45 | ${ }^{34} \mathbf{3} \cdot 61$ | 2312 | ${ }_{653}^{2437}$ | 2785 | ${ }^{2808}$ | ${ }^{3230}$ | 7353 | 7635 | ${ }_{7898} 7$ |  |  |
|  | 54489 | 4387 | 125 | 4183 | 4081 |  |  | 3774 |  | 7735 | 35.0238 | 0463 | 0688 | 0914 | 1139 | 1364 | 1589 | 14 |  |  |  |
|  | 271 | 33988 | 3394 | 329 | 3188 | 3 | ${ }^{2981}$ | ${ }^{2878}$ | 187 |  |  | 4586 | 4814 |  |  | ， |  | 53 | 6181 |  |  |
| ${ }_{88} 8$ |  | 1719 |  |  |  | 1296 | 1190 | 1084 |  |  |  | 2832 | 8366 | 9729 | 9430 | ${ }^{2785}$ | 38988 | 4231 | 4464 |  |  |
|  | 星 10936 | ${ }^{08929} 9$ |  | ${ }^{0} 9723$ |  | 040 | 0294 | ${ }_{\text {O291 }}^{0187}$ | － 0880 |  | 37.0840 | 1079 | ${ }_{1317}^{719}$ | ${ }_{1556}^{7427}$ | ${ }_{1794}^{763}$ |  | － |  |  |  |  |
|  | 159 | 1950 | 8941 | ${ }^{8831}$ | 8722 | 8613 | 8503 | 83 |  |  |  |  | 5443 |  |  |  |  |  |  |  |  |
|  |  |  |  | 7939 | 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 94 | －3 | ${ }_{638}^{727}$ | ${ }^{2} 56$ | 70 | ${ }^{6936}$ | cose | ${ }^{6817}$ | 5703 | ${ }_{6}^{6488}$ | ${ }_{85}^{88.5}$ | ${ }^{383201}$ | 345 | 3694 | ${ }^{394}$ | 4188 | ${ }^{3} 37$ |  |  |  |  |  |
|  | 退 5604 |  |  |  | 5150 |  | 4921 | 4807 | 4692 | 86.45 | ${ }_{39}^{39} 1.442$ | 169 | 1946 | 2198 | 246 |  |  |  | 3456 |  |  |
|  | 64717 | 4602 |  | 4372 | 4256 | 4141 | 4025 |  | 3794 |  |  | 5817 | 6072 | 6326 | 6580 | 6835 | 7089 | ${ }^{343}$ | 7597 |  | 96 |
|  | 8 | ${ }_{282}^{3712}$ | 2775 | ${ }^{3588}$ | 336 | ${ }^{3245}$ | 3130 | 3013 | 1988 | 88．27 | 33：9883 |  | －193 |  |  |  |  |  |  |  |  |
|  |  |  | 1815 |  | 68 |  | 1339 | 1220 | 1100 |  | 40.7924 | ${ }^{8187}$ | 8449 | 8771 | 973 |  | 9498 | 9760 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 280 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $24^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | SINE． |  |  |  |  |  |  |  |  |  | $24^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $31{ }^{\prime}$ | 31 | $32^{\prime}$ | $33^{\prime}$ | 34 | $35^{\prime}$ | $36^{\prime}$ | 37 | 38＇ | $39^{\prime}$ |  | $31{ }^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | 34 | 35 |  |  |  |  |  |
|  | 9100 | 90 | 9097 | 9096 | 9095 | 9094 | 9092 | 9091 | 9090 | 9089 | 4147 |  | 4152 | 41 | 41 | 41 | 4163 | 4165 | 68 | 71 |  |
|  | 819 | 819 | 81 | d | 81 | － | 81 | 8182 | 8180 | 817 | 29 | 8299 | 硣 | 8310 | 8315 | O320 | 8326 | 淅 | 8336 | 341 |  |
|  | 729 | 7295 | 7292 |  | 72 | 7281 | 727 | 727 | 7270 | $2 \cdot 7$ | 12441 | 244 | 2457 | 2465 | 2473 | 248 | 248 | 2496 | 2504 | 25 |  |
|  | 639 | 6394 | 6389 | 6384 | 6379 | 6374 | 636 | 63 | 6360 |  |  | 659 | 660 | 6619 | 6630 | 664 |  | 6662 | 6672 | 668 |  |
| 5 | 5498 | 5492 | 5486 | 5480 | 5474 | 5468 | 5462 | 5456 | 5450 |  |  |  |  | 0774 | 0788 | 0801 |  | 0827 | 0840 | 0854 |  |
| 6 | 459 | 45 | 4583 | 4576 | 4569 |  |  |  |  | $5 \cdot 453$ | 2.4882 | 4897 | 4913 | 4929 | 4945 | 4961 | 4977 | 4993 | 5009 | 5024 |  |
|  | 36 |  |  |  |  |  |  |  |  |  |  | 9047 | 9066 | 9084 | ， | 9121 | 9140 | 9158 | 析 | 195 |  |
|  | 279 | 2787 | 27 | 2768 | 2758 | 27 | 27 |  |  | 7.27 |  | 3197 | 3218 | 3239 | 3260 | 3281 | 330 | 3324 | 3345 | 3366 |  |
|  | 18 |  |  |  |  |  |  |  |  | ． 17 | 732 | 734 | 737 | 73 | 7418 | 7441 | 7465 | 7489 | 7513 | 5337 |  |
| 10 | 099 |  | 0972 | 0960 | 0948 | 0936 | 0924 | 0912 | 0899 | 9.0887 | 469 | 145 | 1522 | 15 | 1575 | 1602 | 1628 | 16 | 168 | 170 | 10 |
| 11 | 009 | 0082 | 006 | 0056 | 0043 | 0029 | 0016 | －003 | 9989 |  |  | 56 | 5674 | 5704 | 5733 | 5762 | 5791 |  |  | 878 |  |
| 12 | 919 | 918 | 91 |  | 9137 | 9 |  |  |  | 10 |  | 97 | 9827 | 9858 | 0 | 99 | 9954 | 9985 | 1017 | 049 | 2 |
| 13 | 82 | 827 |  |  |  | 8 |  |  |  | 11 | 3910 | 394 | 397 | 4013 | 048 | 408 | 41 | 41 | 418 | 42 | 3 |
| 14 | 7395 | 737 | 736 | 7344 | 7327 | 7 | 7293 | 727 |  | $12 \cdot 724$ | 057 | 809 | 8131 |  | 8205 | 8242 | 82 | 83 | 835 |  |  |
| 15 | 649 |  |  |  |  |  |  |  |  |  |  | 224 |  |  | 2363 |  |  | 268 | 25 | 2561 | 15 |
| 16 | 5594 | 5574 |  |  |  |  | 5478 | 5458 | 5439 | $14 \cdot 542$ | 6.6351 | 6393 | 6436 | 6478 | 6520 | 6563 | 6605 | 6647 | 6690 | 673 | 17 |
| 17 | 469 | 46 | 46 | 4632 |  | 45 | 4570 | 4550 | 452 |  |  |  |  | 06 |  | 0723 | 0768 |  |  |  | 17 |
| 18 | 37 | 377 | 375 |  | 3706 | 36 |  |  |  | 16 |  | 46 | 4740 | 47 | 48 | 4883 | 4931 | 4978 | 502 | 507 | 18 |
| 19 | 2893 |  |  |  |  | 2778 |  |  | 2709 |  |  | 88 |  |  | 8993 | 9043 |  | 9144 | 19 | 924 | 19 |
| 20 | 1992 | 196 | 1944 | 1920 | 1896 | 1871 | 1847 | 1823 | 1799 | 18.1775 | 8.2939 | 299 | 3045 | 3097 | 3150 | 32 | 3256 | 3309 | 336 | 341 | 20 |
| 21 | 109 | 106 | 1041 | 1016 | 0990 | 0 | 0940 | 0914 |  |  |  |  | 719 |  | 7308 | 7363 |  |  | 7530 |  | 21 |
| 22 | 01 | 016 |  |  |  |  |  |  |  |  |  | 129 |  |  | 1465 | 1524 |  | 迷 |  |  |  |
| 23 | 929 | 92 | 92 | 9208 | 9180 | 91 | 9124 | 9096 | 9069 |  |  | 54 | 55 | 55 | 562 | 568 | S7 | 58 | 58 | 5927 |  |
| 24 | 83 | 83 | 833 |  |  | 8246 | 8217 |  |  |  | 9.9526 | 959 | 9653 | 97 | 9780 | 98 | 990 | 9971 | 03 | 009 |  |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3938 | 4004 |  | 4136 | 420 | 426 | 25 |
| 26 | 65 | 6559 |  |  |  |  |  | 6370 | 6338 | $23 \cdot 630$ | $10 \cdot 7820$ | 7889 | 7958 | 8027 | 8095 | 8164 | 823 | 8302 | 8371 | 843 | 26 |
| 27 | 569 | 565 | 562 |  |  |  |  |  |  |  |  |  |  |  |  |  | 23 |  |  |  |  |
| 28 | 47 | 475 |  |  |  |  |  |  |  |  | 11.6114 | 6188 |  |  | 6410 |  |  | 6633 |  | 678 |  |
| 29 | 388 | 385 |  |  |  | 371 | 3678 | 3643 | 3608 |  |  | 033 | 04 | 04 | 0568 | 0645 | 072 | 0798 | 0875 | 095 |  |
| 30 | 29 | 2952 | 2916 | 2880 | 2843 | 2807 | 27 | 273 | 2698 | 27 | 12 | 448 | 45 | 46 | 47 | 48 | 488 | 4964 | 043 | 512 |  |
| 31 | 2088 | 2051 | 2013 | 1976 | 1938 |  | 186 |  |  | 28.17 | 12．8555 | 8637 |  |  |  |  |  |  |  |  |  |
| 32 |  | 114 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 33 | 028 | 024 | 0208 | 0168 | 0128 |  | 0048 | －008 |  |  | 13 | 693 | 7023 |  |  | 7285 | 737 |  | 7547 | 763 |  |
| 34 | 93 |  |  |  | 9223 | 9181 |  |  |  | $30 \cdot 90$ | 14 | 108 | 1176 | 1266 | 1356 | 1446 | 153 | 1625 | 715 | 80 |  |
| 35 | 848 |  |  |  |  |  |  |  |  |  |  | 52 |  | 54 |  |  | 569 | 5791 | 5883 | 597 |  |
| 36 | 75 | 7543 | 749 | 7456 | 7412 | 7369 | 7325 |  | 723 | 32719 | 14.929 | 938 | 948 | 9575 | 9671 | 9766 | 986 | 9956 | －051 |  |  |
| 37 | 6686 | 664 | 659 |  | 6507 | 6462 | 641 |  |  |  |  | 353 |  |  | 3828 | 39 | 40 | 4122 | 4220 |  |  |
| 38 | 57 |  |  | 56 | 5602 |  |  |  |  | 34.53 |  |  |  |  |  |  | 818 |  |  |  |  |
| 39 | 488 | 4838 |  | 47 | 4696 | 46 | 4602 | 455 | 4508 |  |  | 183 |  | 2040 |  |  | 235 | 3 | 2556 | 26 |  |
| 40 | 3985 | 3936 | 3888 | 38 | 379 | 374 | 3694 | 3646 | 3598 | 36 | $16 \cdot 5$ | 59 | 6089 | 61 | 6301 | 64 | 65 | 6618 | 672 | 683 |  |
| 41 | 3084 | 3035 |  | 293 | 2886 |  |  |  |  | 37.263 | $17 \cdot 0024$ |  |  |  |  |  |  |  |  |  |  |
| 42 | 218 | 2133 | 208 | 203 | 1981 |  |  |  |  |  | 17.41 |  |  |  | 461 | 47 |  |  |  |  |  |
| 43 | 128 |  |  |  | 1076 |  | 097 |  |  |  |  |  |  |  | 377 |  | 900 |  |  | 934 |  |
| 44 |  |  |  |  | 0 | 0117 |  |  | 995 | 39.99 |  | 258 |  |  | 2931 |  | 3164 |  |  | 351 |  |
| 45 | 94 |  | 937 | 932 | 9265 |  | 9156 |  | 9047 | 40.89 | 18.661 | 673 |  |  |  |  | 732 |  |  |  |  |
| 46 | 85 | 852 |  | 841 |  | 830 |  |  |  | 41.808 |  |  |  |  |  |  |  |  |  |  |  |
| 47 | 76 | 762 |  |  |  |  |  |  |  |  |  |  |  |  | 5403 |  | 565 | 5776 |  |  |  |
| 48 | 6781 | 672 | 666 | 66 | 4， | 649 | 643 | 6375 | 631 | 43 | 19.9053 |  |  |  | 9561 |  |  | 9942 | ＋069 |  |  |
| 49 | 588 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | 49 | 4920 | 4860 | 48 | 4739 | 4679 | 4618 | 4558 | 44 | 45 | $20^{\circ}$ | 7479 | 7611 | 7744 | 7876 | 8008 | 8140 | 8273 | 8405 | 853 |  |
| 51 | 4080 |  |  |  |  |  |  |  |  |  | 21.1 |  |  |  |  |  |  |  |  |  |  |
| 52 | 318 | 31 | 305 | 29 | 2929 | 286 |  | 27 | 26 | 47－26 | $21 \cdot 5$ |  |  |  | 6131 | 632 | 646 | 6604 | 674 | 687 |  |
| 53 | 227 | 221 |  |  |  |  |  |  |  | 48．17 | 21.9 |  |  |  |  |  | 06 | 076 |  |  |  |
| 54 | 137 |  |  |  | 18 | 105 |  |  | 0857 | 49 | 22 |  |  | 363 | 506 |  | 479 | 析 | 07 | 522 |  |
| 55 | 047 | 041 | 03 | 0279 | 0213 |  |  | ． 013 |  | 49 |  |  |  | 8518 |  |  | 895 | 9100 | 9245 | 391 | 55 |
| 56 | 957 |  |  |  |  |  |  |  |  |  | 23 |  |  |  |  |  |  |  |  |  |  |
| 57 | 8678 |  |  |  |  | 8334 |  |  | 8126 | 5 | 23 |  |  |  |  |  |  |  |  |  |  |
| 58 | 77 | 7708 |  |  |  | 742 | 735 |  | 721 | 52 | 24 |  |  |  | 1136 | 12 | 1443 | 15 | 175 | 190 |  |
| 59 | 68 |  |  |  |  |  |  |  |  |  |  | 48 |  |  | 529 |  | 56 | 5762 | 59 |  |  |
| 60 | 5977 | 5904 | 5832 | 575 | 5687 | 5614 | 5542 |  | 5396 | 54.532 | 24 | 897 | 913 | 9292 | 945 | 961 | 97 | 992 | －08 | 02 |  |
|  | 5076 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 4176 | 410 | 402 |  | 3876 |  |  |  |  | 56 |  |  |  |  |  |  |  |  | 842 |  |  |
| 63 | 327 |  |  |  |  |  |  |  |  | 57 | $26 \cdot 12$ | 142 |  |  |  |  |  |  |  |  |  |
| 64 | 237 |  |  |  | 2066 |  |  |  |  | 58.167 |  |  |  | 59 | 6081 |  | 64 | 6589 | 67 | 10 |  |
| 65 | 14 | 139 | 131 | 1239 |  | 108 |  |  |  |  | 26 | 97 |  | －06 |  |  | 058 | 0754 | 0926 |  |  |
|  | 057 | 049 |  |  | 0256 |  |  |  |  |  |  |  |  | 422 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 877 | 86 | 861 | 8527 | 844 | 836 |  | 8198 | 811 | 61 |  |  |  |  | 271 | 28 | 307 | 3251 | 3 |  |  |
| 69 | 7873 |  |  |  |  | 7456 |  |  | 720 |  | 28.61 | 63 |  | 668 | 686 | 705 | 72 | 741 | 599 |  |  |
| 70 | 6973 |  |  |  |  |  |  |  |  |  | $29 \cdot 0285$ |  |  |  | 102 | 121 |  | 158 | 176 | 195 |  |
| 71 | 607 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 517 | 508 | 49 | 49 | 482 | 473 | 465 | 456 | 447 | 65 | $29 \cdot 8$ |  | 89 | 91 | 93 |  | 978 | 硣 | ＋103 | 029 |  |
|  | 4272 |  |  |  |  |  |  |  | 356 | $66^{*} 34$ | $30 \cdot 27$ | 29 | 31 | 330 | 349 | 368 |  | 4078 | 427 | 446 |  |
| 7 | 3371 | 328 | 3193 | 103 | 30 | 292 | 28 |  |  | 67．25 |  |  |  |  | 765 | 785 | 804 | 8244 | 843 |  |  |
| 75 | 247 | 2380 | 2290 |  |  |  |  | 1836 | 1745 | $68 \cdot 165$ | $31 \cdot 10$ | 121 | 141 | 161 | 181 | 201 | 22 | 24 | 260 | 280 | 75 |
| 76 | 157 |  | 1387 |  |  |  |  |  | 083 | 69.074 | 31．51 |  | 556 | 577 | 59 |  | 637 |  | ¢ |  |  |
|  | 067 |  |  |  |  |  |  |  |  | 69.983 | $31 \cdot 93$ | 9518 |  | 992 | 12 | 硣 |  |  |  |  |  |
| 78 | 977 | 967 | 958 | 9487 | 939 | 929 | 920 | 9110 | 901 | 70.892 | $32 \cdot 34$ | 366 | 3874 | 4080 | 428 | 449 | 469 | 490 | 511 | 53 |  |
| 79 | 8869 |  | 8679 |  |  |  |  | ， | 105 | $71 \cdot 80$ | 32．7608 | 781 | 8026 | 823 | 844 | 865 | 886 | 907 | 28 |  |  |
| 80 | 7969 | 7872 | 7776 | 79 | 82 | 7486 | 738 | 21 | 7195 | 72•7098 | 33．1755 | 1966 | ， | 235 | 260 |  | 302 | 323 | 344 |  |  |
|  | 7069 | 697 | 6873 | 6775 | 6677 | 657 | 6481 | 547 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 6168 | 6069 | 59 | 5871 | 5772 | 56 | 557 | 547 | 537 | 74.527 | 34．00 | 026 | 048 | 070 | 09 | 113 | 135 | 156 | 178 | 200 |  |
|  | 526 | 5168 | S |  | 4867 |  | 475 | 4565 | 4，65 |  |  | 265 | 4637 | 485 | 5074 | 529 | 5 | 5733 | 矿 | ， |  |
| 84 | 436 | 4266 | 416 | 40 | 396 | 386 | 375 | 3657 | 3555 | 76.345 |  | 856 | 878 | 900 | 923 | 94 | 967 | 989 | $1 / 2$ | 034 |  |
| 85 | 34 |  |  |  |  | 2954 | 2851 | 2748 | 2645 | $77 \cdot 254$ | 35．24 | 27 | 2939 | 3164 | 338 | 361 | 3839 | 4064 | 4288 | 45 |  |
| 86 | 2567 |  |  |  | ， | 204 |  |  |  | － | 35．663 | 686 |  | 7 | 7546 | 7774 |  |  |  |  |  |
|  | 1666 | 156 | 145 | 1351 | 1246 | 1141 | 1035 |  | 0825 | ， |  | 1013 | 124 | 4 47 | 170 | 193 | 2120 | 25 | 268 |  |  |
|  | 0766 | 0660 |  | 0447 | 0341 | 0234 | 0128 | ＋021 | 9915 | 79.980 | $36^{\circ} 49$ | 516 | 539 | 5629 | 586 | 609 | 63 | 65 | 67 | 70 |  |
| 89 | 986 | 9758 | 9651 |  | 9436 | 9328 |  | 212 | 2004 |  | （ | 931 | 9548 | 978 | P019 | 225 | 049 | 2725 | 991 |  |  |
| 90 | 89 | 8857 | 48 | 8639 | 8530 | 8421 | 8312 | 8204 | 094 | $81 \cdot 798$ | 37－3224 | 346 | 370 |  | ， | 441 | 465 | 489 | 512 |  |  |
| 91 | 8065 | 7955 |  | 7735 | 7625 | 751 | 05 | 7295 | 718 | 82.707 | $37 \cdot$ | 761 |  |  |  | 85 | 881 | 95 | 9297 |  |  |
| 92 | 7164 | 位 | 6942 |  | 6720 | 6609 | 6497 | 6386 | 627 | 83：616 | $38 \cdot 15$ | 17 |  | 22 | 249 | 27 | 297 | 32 | 3465 | 370 |  |
| 93 | 6264 | 615 | 6040 | 927 | 5815 | 5702 | 5590 | 5477 | 5 | 84．525 | 381818 | 砣 | 615 | 矿 | 664 | 6895 | 141 | 738 | 63 | 寿 |  |
| 94 | 5364 | 源 | 3 | 13 | 49 |  | 4682 | 4568 | 445 | 85.4340 | 38．9812 | ．060 | 03 | 0558 | 080 | 105 | 130 | 15 | 180 | 2050 |  |
|  | 44 |  | 4234 | 4119 | 4004 | 3889 | 3774 |  |  | 86.3429 | 39.395 | 4210 | 446 | 471 | 496 | 5215 |  | 5718 | 5969 | 6220 |  |
| 96 | 356 | ${ }^{3447}$ | 331 | 21 | 3099 | 2983 | 2867 | 50 |  |  |  |  |  |  | 9122 |  |  | 883 |  |  |  |
|  | 2662 | 25 | 2428 | 2311 | 2194 | 207 | 1959 | 1842 | 1724 | 88.160 | 40．2252 | 250 | 2766 | 3023 | 327 | 3535 | 3792 | 4049 |  | 4562 |  |
| 98 | 1762 | 074 | 1526 | 507 |  | 026 | 1051 | 0933 | 14 | 89.069 | $40^{\circ} 6399$ | 665 | 6918 | 7177 | 7437 | 76 | 79 | 8214 | 8474 | 8733 |  |
|  | 0862 | 0742 | 0623 | 050 | 038 | 0264 | 0144 | －024 | 9 | 89.9784 | 41.0546 | 808 |  | 332 |  |  | 2178 |  | 2642 | 㖪 |  |
| 100 | 9961 | 884 | 9720 | 959 | 9478 | 9357 | 9236 | 9115 | 8994 | 90.8873 | 41.4693 | 4958 | 5223 | 5487 | 5752 | 6016 | 6281 | 6545 | 6810 | 7074 | 100 |
|  | 30＇ | 29 | 28 | 27 | 26 | 25 | $24^{\prime}$ | $23^{\prime}$ | $2 z^{\prime}$ | 21 | －${ }^{\prime}$ | ${ }^{\prime}$ | 28 | $27^{\prime}$ | $26^{\prime}$ | $25^{\prime}$ | 1 | $23^{\prime}$ | $22^{\prime}$ | $21^{\prime}$ |  |
| 65 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

| $25^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $25^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $11^{\prime}$ | $12^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ | $17^{7}$ | $18^{\prime}$ | $19^{\prime}$ | $10^{\prime}$ | 11 | $12^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ | $17^{\prime}$ |  |  |  |
|  | 9051 | 905 | 9048 | 19047 | 9046 | 9045 | 9043 | 904 | 9041 | 904 | 4253 | 4255 | 4258 | 4260 | 4263 | 4266 | 4268 | 42 | 42 | 76 |  |
|  | 8101 | 8099 | 8097 | 8094 | 8092 | 8089 | 8087 | 8084 | 8082 | 188079 | 8505 | 8510 | 8516 | 8521 | 8526 | 8531 | 8537 | 8542 | 8547 | 8552 |  |
| 3 | 7152 | 7149 | 7145 | 7141 | 7137 | 7134 | 7130 | 7126 | 7122 | 2.7119 | 2758 | 2765 | 2773 | 2781 | 2789 | 2797 | 2805 | 2813 | 2821 | 2829 |  |
|  | 6203 | 6198 | 6193 | 6188 | 6183 | 6178 | 6173 | 6168 | 6163 | 3.6158 | 1.7010 | 7021 | 7031 | 7042 | 7052 | 7063 | 7073 | 7084 | 7094 | 7105 |  |
| 5 | 5254 | 5248 | 5241 | 5235 | 5229 | 5223 | 5217 | 521 | 5204 | $4 \cdot 5198$ | $2 \cdot 1263$ | 1276 | 128 | 1302 | 1315 | 1328 | 1342 | 135 | 1368 | 138 | 5 |
| 6 | 4304 | 42 | 429 | 4282 | 4275 | 4267 | 50 | 4252 | 4245 | 5.423 | 2.5515 | 5531 | 554 | 5563 | 5578 | 5594 | 5610 | 5626 | 564！ | 15657 |  |
| 7 | 3355 | 3347 | 3338 | 3329 | 3321 | 3312 | 3303 | 3294 | 3286 | 6．3277 | 2.976 | 978 | 98 | 9823 | 9841 | 9860 | 9878 | 9897 | 9915 | 9933 |  |
| 8 | 2406 | 2396 | 2386 | 2376 | 2366 | 2356 | 2346 | 233 | 2327 | 7.231 | 3.4020 | 4041 | 4062 | 4083 | 4104 | 4125 | 4147 | 4168 | 4189 | 4210 |  |
|  | 1457 | 1446 | 1434 | 1423 | 1412 | 1401 | 1390 | 1379 | 1367 | 8.135 | 3.8273 | 8296 | 8320 | 8344 | 8368 | 8391 | 8415 | 8439 | 8462 | 8486 |  |
| 10 | 0507 | 0495 | 0483 | 2470 | 0458 | 0446 | 0433 | 0421 | 0408 | 9.0396 | 4.25 | 2552 | 257 | 26 | 2631 | 2657 | 2683 | 2709 | 2736 | 2762 | 0 |
| 11 | 955 | 9545 | 9531 | 9517 | 95 | 9490 | 947 | 9463 | 9449 | 9.9 | 6778 | 6807 | 6836 | 6865 | 94 | 23 | 51 | 69 | 7009 | 7038 | 11 |
| 12 | 8609 | 8594 | 8579 | 8564 | 8550 | 8535 | 8520 | 850 | 8490 | 10.8475 | 5.1030 | 1062 | 1094 | 1125 | 1157 | 1188 | 1220 | 1251 | 1283 | 1314 | 12 |
| 13 | 7660 | 7644 | 7628 | 7611 | 7595 | 7579 | 7563 | 7547 | 7531 | 11.7515 | 5.5283 | 5317 | 5351 | 5386 | 5420 | 5454 | 5488 | 5522 | 5557 | 559 | 13 |
| 14 | 6710 | 6693 | 6676 | 6658 | 6641 | 6624 | 6606 | 6589 | 6572 | 12.655 | 5.9535 | 9572 | 9609 | 9646 | 9683 | 9720 | 9756 | 9793 | 9830 | 986 | 14 |
| 15 | 5761 | 5743 | 5724 | 5705 | 5687 | 5668 | 5650 | 5631 | 5612 | 13.5594 | 6．3788 | 3827 | 3867 | 3906 | 3946 | 3985 | 4025 | 4064 | 4104 | 4143 | 15 |
| 16 | 4812 | 4792 | 477 | 475 | 4733 | 4713 | 4693 | 467 | 4653 | 14．4633 | 6.8 | 808 | 8125 | 8167 | 82 | 8251 | 8293 | 833 | 8377 | 8419 | 16 |
| 17 | 3863 | 3842 | 3821 | 3800 | 3778 | 3757 | 3736 | 3715 | 369 | 15．3673 | 2293 | 2338 | 2382 | 2427 | 2472 | 2517 | 2561 | 2606 | 2651 | 26 | 17 |
| 18 | 2913 | 2891 | 286 | 28 | 28 | 2802 | 278 | 27 | 27 | 16.2712 | －654 | 6593 | 6640 | 6688 | 6735 | 6782 | 6830 | 6877 | 6924 | 6972 | 18 |
| 19 | 1964 | 1941 | 1917 | 1894 | 1870 | 1846 | 23 | 1799 | 1776 | $17 \cdot 175$ | ． 079 | 0848 | 0898 | 0948 | 0998 | 1048 | 1098 | 1148 | 1198 | 1248 | 19 |
| 20 | 1015 | 0990 | 0965 | 09 | 0916 | 0891 | 0866 | 0841 | 08 | 18.0792 | 8.5051 | 5103 | 5156 | 209 | 5261 | 5314 | 5366 | 5419 | 5472 | 5524 | 20 |
| 21 | 0066 | 0040 | 014 | 9988 | 99 | 9936 | 9910 | 9883 | 9857 | 18.9831 | 9303 | 9358 | 9414 | 9469 | 9524 | 57 | 9635 | 9690 | 9745 | 9800 | 21 |
| 22 | 9116 | 9089 | 9062 | 9035 | 9007 | 8980 | 8953 | 8925 | 8898 | 19.8871 | 9．355 | 3614 | 367 | 372 | 3787 | 3845 | 39 | 396 | 4019 | 407 | 22 |
| 23 | 8167 | 8139 | 8110 | 8082 | 8053 | 8025 | 7996 | 7968 | 7939 | $20 \cdot 7910$ | 7808 | 7869 | 7929 | 799 | 8050 | 8111 | 817 | 823 | 8292 | 8353 | 23 |
| 24 | 7218 | 7188 | 7159 |  | 7099 | 7069 | O39 | 7010 | 698 | 21．6950 | 10．2061 | 2124 | 2187 | 2250 | 2313 | 2376 | 244 | 2503 | 2566 | 2629 | 24 |
| 25 | 6269 | 6238 | 6207 | 6176 | 6145 | 6114 | 6083 | 6052 | 6021 | $22 \cdot 5990$ | 10.6313 | 6379 | 6445 | 6511 | 6576 | 6642 | 670 | 6774 | 6839 | 690 | 25 |
| 26 | 5319 | 5287 | 5255 | 5223 | 519 | 515 | 5126 | 5094 | 50 | 23 | 11.056 | 063 | 0703 | 07 | 08 | 0908 | 097 | 1045 | 113 | 1181 | 26 |
| 27 | 4370 | 4337 | 4303 | 4270 | 42 | 4203 | 69 | 4136 | 4102 | 24.4069 | 11.4818 | 4889 | 496 | 503 | 5103 | 5174 | 52 | 53 | 5387 | 5458 | 27 |
| 28 | 3421 | 3386 | 3352 | 33 | 32 | 3247 | 3213 | 317 | 3143 | $25 \cdot 3108$ | 11.90 | 9145 | 921 | 929 | 9366 | 943 | 9513 | 958 | 9660 | 97 | 28 |
| 29 | 247 | 2436 | 2400 | 2364 | 23 | 2292 | 2256 | 22 | 2184 | 26．2148 | 12.33 | 3400 | 3476 | 355 | 3629 | 3705 | 378 | 385 | 3934 | 401 | 29 |
| 30 | 15 | 1485 | 1448 | 1411 | 1374 | 1337 | 99 | 62 | 25 | $27 \cdot 1187$ | 12.7576 | 55 | 34 | 7813 | 2 | 7971 | 804 | 8128 | 3207 | 8286 | 30 |
| 31 | 057 | 0535 | 996 | 0458 | 042 |  | 0343 | 0304 | 0266 | $28^{\circ} 0227$ | 13.1828 | 1910 | 992 | 2073 |  | 223 | 2318 |  |  |  | 31 |
| 32 | 9624 | 9584 | 9545 | 950 | 9465 | 9426 | 938 | 934 | 9306 | 28．9267 | $13 \cdot 608$ | 6165 | 6249 | 6334 | 6418 | 6502 | 65 | 6670 | 6755 | 6839 | 32 |
| 33 | 8675 | 8634 | 8593 | 85 | 8511 | 8470 | 8429 | 8388 | 8347 | 29 •8306 | 14.0333 | 0420 | 0507 | 0594 | 0681 | 076 | 085 | 094 | 1028 | 111 | 33 |
| 34 | 7725 | 7683 | 7641 | 7599 | 7557 | 5 |  | 7430 | 7388 | 30．7346 | 14.4586 | 4675 | 4765 | 4854 | 4944 | 503 | 5123 | 5212 | 5302 | 539 | 34 |
| 35 | 6776 | 6733 | 6689 | 6646 | 6603 | 6559 | 6516 | 6472 | 6429 | 31.6385 | 14.8838 | 8931 | 9023 | 9115 | 9207 | 929 | 939 | 9483 | 9575 | 966 | 35 |
| 36 | 5827 | 5782 | 38 | 5693 | 5649 | 5604 | 5559 | 514 | 547 | $32 \cdot 5425$ | 15 | 31 | 3281 | 33 | 3470 | 35 | 3659 | 3754 | 3849 | 3943 | 36 |
| 37 | 4878 | 4832 | 47 | 4740 | 46 | 4648 | 602 | 4557 | 4511 | 33．4465 | 15.73 | 7441 | 7538 | 76 | 7733 | 7830 | 792 | 80 | 8122 | 82 | 37 |
| 38 | 3928 | 3881 | 3834 | 3787 | 3740 | 3693 | 3646 | 3599 | 3551 | 36．350 | 16.15 | 1696 | 179 | 1896 | 1996 | 2096 | 2196 | 2296 | 239 | 249 | 38 |
| 39 | 2979 | 2931 | 2883 | 28 | 27 | 2737 | 2689 | 264 | 2592 | 35 | 16.58 | 595 | 605 | 6157 | 6259 | 636 | 646 | 656 | 6670 | 677 | 39 |
| 40 | 2030 | 1980 | 1931 | 1881 | 1832 | 82 | 32 | 83 | 33 | 36．1583 | 17.0101 | 206 | 0312 | 041 | 0522 | 627 | 3 | 0838 | 0943 | 1048 | 40 |
| 41 | 108 | 1030 | 79 | 0928 | 08 | 0827 | 0776 | 0725 | 06 | $37 \cdot 0623$ | 17．4354 | 4462 | 4570 | 4677 | 4785 | 4893 | 5001 | 5109 | 7 |  | 41 |
| 42 | 0131 | 0079 | －027 | 9975 | 9923 | 9871 | 9819 | 9767 | 9715 | $37 \cdot 9662$ | 17．8606 | 8717 | 8827 | 8938 | 9048 | 915 | 9269 | 9380 | 949 | 9601 | 42 |
| 43 | 9182 | 9129 | 9076 | 9022 | 8969 | 8916 | 362 | 8809 | 8755 | 38．870 | 18.2859 | 2972 | 3085 | 3198 | 3311 | 342 | 3538 | 3651 | 3764 | 387 | 43 |
| 44 | 8233 | 8178 | 8124 | 8069 | 8015 | 60 |  | 7851 | 7796 | $39 \cdot 7742$ | $18: 7111$ | 7227 | 73 | 7459 | 7574 | 76 | 780 | 7922 | 803 | 815 | 44 |
| 45 | 7284 | 7228 | 7172 | 7116 | 7061 | 7005 | 49 | 6893 | 6837 | $40 \cdot 6781$ | 19.1364 | 1482 | 1601 | 1719 | 1838 | 195 | 207 | 2193 | 231 | 2429 | 45 |
| 46 | 6334 | 6277 | 6220 | 616 | 6106 | 209 | 59 | 5935 | 587 | 41．5821 | 19.5616 | 57 | 585 | 59 | 6101 | 6222 | 634 | 6464 | 35 |  | 46 |
| 47 | 5385 | 5327 | 5269 | 52 | 5152 | 94 | 5036 | 4977 | 4919 | 424860 | 19.9869 | 999 | －116 | 0240 | 0364 | 0487 | 0611 | 0735 | 0858 | 098 | 47 |
| 48 | 4436 | 4376 | 4317 | 4258 | 4198 | 4138 | 4079 | 4019 | 3960 | 43.39 | 20.4121 | 424 | 4374 | 4500 | 4627 | 4753 | 4879 | 5006 | 513 | 525 | 48 |
| 49 | 3487 | 3426 | 3365 |  | 3244 |  | 3122 | 3061 | 3000 | 44．29 | 20.8374 |  | 8632 | 87 | 8890 | 9019 | 9148 | 9277 | 9405 |  | 49 |
| 50 | 2537 | 2475 | 2414 | 2352 | 90 | 28 | 2166 | 2103 | 2041 | 45．1979 | 21．2626 | 2758 | 289 | 302 | 3153 | 3284 | 3416 | 35 | 367 | 3810 | 50 |
| 51 | 15 | 1525 | 1462 | 139 | 1335 | 1272 | 1209 | 1145 | 1082 | 46．1019 | 21.6879 | O13 | 714 | 7282 | 416 | 7550 | 7684 | 7818 | 7953 |  | 51 |
| 52 | 0639 | 0574 | 0510 | 0446 | 0381 | 0317 | 0252 | 0188 | 0123 | 47－0058 | 22.1131 | 1268 | 1405 | 1542 | 1679 | 1816 | 1953 | 2089 | 2226 | 236 | 52 |
| 53 | 969 | 9624 | 9558 | 9493 | 9427 | 9361 | 9295 | 9230 | 9164 | 47．9098 | 22.5384 | 5524 | 5663 | 5803 | 5942 | 6081 | 6221 | 6360 | 6500 | 663 | 53 |
| 54 | 8740 | 8673 | 8607 | 8540 | 8473 | 406 | 339 | 8272 | 8205 | 48.8137 | 22.9637 | 9779 | 992 | －063 | 0205 | 034 | 0489 | 0631 | 077 | 091 | 54 |
| 55 | 779 | 7723 | 55 | 7587 | 7519 | 50 | 7382 | 7314 | 7245 | 49.7177 | 23＇3889 | 4034 | 4179 | 4323 | 446 | 461 | 4757 | 4902 | 504 | 5191 | 55 |
| 56 | 6842 | 6773 | 6703 | 663 | 6564 | 495 | 6425 | 6356 | 6286 | 150．6217 | 23.8142 | 8289 | 8436 | 8584 | 8731 | 8878 | 9026 | 9173 | 9320 | 946 | 56 |
| 57 | 589 | 5822 | 57 | 56 | 5610 | 39 | 5469 | 5398 | 5327 | 51＇5256 | 24.2394 | 2544 | 2694 | 2844 | 2994 | 3144 | 3294 | 3444 | 3594 | 374 | 57 |
| 58 | 4943 | 4872 | 4800 | 4728 | 4656 | 4584 | 4512 | 4440 | 4368 | 52．4296 | 24.6647 | 679 | 6952 | 7105 | 7257 | 7410 | 7562 | 7715 | 786 | 80 | 58 |
| 59 | 3994 | 3921 |  | 3775 |  |  |  | 3482 | 3409 | 53.3335 | 25.0899 | 105 | 12 | 1365 | 152 | 167 | 18 | 1986 | 214 |  | 50 |
| 60 | 3045 | 2971 | 2896 | 2822 | 2748 | 2673 | 2599 | 2524 | 2450 | 54．2375 | $25 \cdot 5152$ | 5310 | 5468 | 5626 | 5783 | 594 | 60 | 6257 | 641 | 657 | 60 |
| 61 | 20 | 2020 | 1945 | 1869 | 1793 | 18 | 642 |  |  | 55 | 25.9404 | 956 |  | 988 |  |  |  |  |  |  | 61 |
| 62 | 1146 | 1070 | 0993 | 0916 | 0839 | 0762 | 0685 | 0608 | 0531 | 56.0454 | $26 \cdot 3657$ | 3820 | 3983 | 4146 | 4309 | 4473 | 4636 | 4799 | 4962 | 5125 | 62 |
| 63 | 0197 | 0119 | 1041 | 99 | 9885 | 9807 | 9729 | 9650 | 9572 | 56．9494 | $26 \cdot 790$ | 807 | 82 | 8407 | 857 | 8738 | 8904 | 9070 | 923 |  | 63 |
| 64 | 9248 |  |  | ， |  | 8851 | 8772 | 8692 | 8613 | －8533 | $27 \cdot 2162$ | 235 | 2499 | 2667 | 2836 |  | 3172 | 3341 | 778 | 367 | 64 |
| 65 | 8298 | 18 | 8138 | 8057 | 76 | 896 | 815 | 7734 | 7654 | 58.7573 | $27 \cdot 641$ | 658 | 6757 | 6928 | 709 | 727 | 744 | 7612 | 778 | 995 | 65 |
| 66 | 7349 | 7268 | 7186 | 7104 | 22 | 6940 | 6858 | 6776 | 6694 | 59.6612 | 28.0667 | 0841 | 1014 | 1188 | 1362 | 1535 | 1709 | 1883 | 2056 | 223 | 66 |
| 6 | 6400 | 6317 | 6234 | 6151 | 6068 | 5985 | 5902 | 5819 | 5735 | 60．5652 | 28.4919 | 509 | 5272 | 5448 | 562 | 58 | 597 | 6154 | 6330 |  | 67 |
| 68 | 5451 | 5367 | 5282 | 5198 | 5114 | 5029 | 4945 | 4861 | 4776 | 61.4692 | 28.9172 | 935 | 9530 | 9709 | 988 | －067 | 0246 | 0425 | 0603 | 078 | 68 |
| 69 | 4501 | 4416 | 433 | 4245 | 4160 | 4074 | 888 | 3903 | 3817 | 62.3731 | 29.3424 | 3606 | 3788 | 3969 | 415 | 433 | 4514 | 4695 | 487 | 505 | 69 |
| 70 | 3552 | 3466 | 3379 | 3292 | 3205 | 3119 | 3032 | 2945 | 2858 | 63．2771 | 29.7677 | 786 | 8046 | 8230 | 8414 | 8598 | 8782 | 8966 | 915 | 933 | 70 |
| 71 | 2603 | 2515 | 242 |  | 2251 |  | 2075 | 1987 | 1899 | 析 | 30．19 | 2116 | 2303 |  | 2070 | 286 | 30 | 3237 |  |  | 71 |
| 72 | 1654 | 1565 | 1476 | 1386 | 1297 | 1208 | 1118 | 1029 | 0939 | $65^{\circ} 0850$ | $30 \cdot 618$ | 6372 | 6561 | 6751 | 6940 | 7129 | 7319 | 7508 | 7698 | 788 | 72 |
| 73 | 0704 | 0614 | 0524 | 0433 | 0343 | 0252 | 0162 | －071 | 9980 | 65．9889 | 31.0435 | 0627 | 0819 | 1011 | 1203 | 1395 | 1587 | 1779 | 197 | 216 | 73 |
| 75 | 9755 | 9664 | 9572 | 9480 | 9389 | 9297 | 9205 | 9113 | 9021 | $66^{\circ} 8929$ | 31＇4687 | 488 | 5077 | 5271 | 546 | 566 | 5856 | 6050 | 624 | 643 | 74 |
| 75 | 8806 | 8713 | 8620 | 8527 | 334 | 8341 | 8248 | 8155 | 8062 | 67•7969 | 318940 | 9137 | 9334 | 9532 | 972 | 992 | 124 | 032 | 051 | 071 | 75 |
| 76 | 785 | 7763 | 7669 | 7574 | 7480 | 7386 | 7292 | 7197 | 7103 | 68．7008 | $32 \cdot 3192$ | 3392 | 3592 | 3792 | 3992 | 4192 | 4392 | 4592 | 4792 | 499 | 76 |
| 78 | 6907 | 6812 | 6717 | 6621 | 6526 | 6430 | 6335 | 6239 | 6144 | 69．6048 | $32 \cdot 7445$ | 7647 | 7850 | 8053 | 8255 | 8458 | 8660 | 8863 | 06 |  | 77 |
| 78 | 5958 | 5862 | 5765 | 5668 | 5572 | 5475 | 5378 | 5281 | 5184 | 70.5087 | 33.1697 | 1903 | 2108 | 2313 | 2518 | 2724 | 2929 | 3134 | 3339 | 354 | 78 |
| 79 | 5009 | 4911 | 4813 | 4716 | 4618 | 4520 | 4421 | 4323 | 4225 | 71.4127 | 33．5950 | 6158 | 6366 | 6574 | 6781 | 6989 | 7197 | 7405 | 7613 | 782 | 79 |
| 80 | 4060 | 3961 | 202 | 3763 | 663 | 3564 | 3465 | 3365 | 3266 | $72 \cdot 3167$ | 34.0202 | 0413 | 0623 | 083 | 1044 | 1255 | 146 | 1676 | 188 | 2097 | 30 |
| 81 | 3110 | 3010 | 2910 | 2810 | 279 | 2609 | 2508 | 2408 | 仡 |  | 34.445 | 4668 |  |  | 5308 | 5521 | 5734 |  | 析 |  | 81 |
| 8 | 2161 | 2060 | 1958 | 1857 | 1755 | 1653 | 1551 | 1450 | 1348 | 74．1246 | 34.8707 | 8923 | 9139 | 9355 | 9571 | 9786 | －002 | 0218 | 0433 | 064 | 82 |
|  | 1212 | 1109 | 1006 | 0904 | 0801 | 0698 | 0595 | 0492 | 0388 | 75．0285 | $35 \cdot 2960$ | 3178 | 3397 | 3615 | 3834 | 4052 | 4270 | 4489 | 4707 | 492 | 83 |
| 84 | 0263 | 0159 | －055 | 9951 | 9847 | 9742 | 9638 | 9534 | 229 | 75.9325 | $35 \cdot 7212$ | 7434 | 7655 | 7876 | 8097 | 8318 | 8539 | 8760 | 8981 | 920 | 88 |
| 85 | 931 | 9208 | 9103 | 8998 | 8892 | 878 | 881 | 8576 | 8470 | $76 \cdot 8364$ | 36.1465 | 1689 | 1912 | 2136 | 2360 | 258 | 280 | 303 | 325 | 347 | 35 |
| 86 | 8364 | 8258 | 8151 | 8045 | 7938 | 7831 | 7725 | 7618 | 7511 | $77 \cdot 7404$ | $36 \cdot 5717$ | 5944 | ｜6170 | 6397 | 6623 | 6849 | 7075 | 7302 | 7528 | 77 |  |
| 87 | 7415 | 7307 | 720 | 保 | 6984 | 6876 | 6768 | 6660 | 6552 | $78^{\circ} 6444$ | 36.997 | ＋199 | 0428 | 0657 | 0886 | 1115 | 1344 | 1573 | 180 | 砣 | 87 |
| 88 | 6466 | 6357 | 6248 | 6139 | 6030 | 5920 | 5811 | 5702 | 5593 | 79．5483 | 37－4222 | 4454 | 4686 | 4917 | 5149 | 5380 | 5612 | 5844 | 6075 | 630 | 88 |
| 89 | 5516 | 5406 | 5296 | 5186 | 5075 | 4965 | 4855 | 4744 | 4633 | $80 \cdot 4523$ | 37.8475 | 8709 | 8944 | 9178 | 9412 | 964 | 988 | －114 | 0349 | 05 |  |
| 90 | 4567 | 4456 | 4344 | 4233 | 4121 | 4010 | 3898 | 3786 | 367 | 813562 | $38 \cdot 2728$ | 296 | 320 | 3438 | 3675 | 391 | 414 | 438 | 4622 | 4859 | 9 |
| 91 | 3618 | 3505 | 3393 | 3280 | 3167 | 3054 | 2941 | 2828 | 2715 | $82 \cdot$ | 38． 698 | 7220 | 45 | 699 | 7938 | 8178 | 8417 | 8656 | 8896 | （1351 | 91 |
| 92 | 2669 | 2555 | 2441 | 2327 | 2213 | 2099 | 1985 | 1870 | 1756 | $83 \cdot 1642$ | $39 \cdot 1233$ | 1475 | 1717 | 1959 | 2201 | 2443 | 2685 | 2927 | 3169 | 341 | 92 |
| 93 | 1719 | 160 | 1489 | 1374 |  | 1 | 1028 | 0912 | 0797 | 84.0681 | $39 \cdot 5485$ | 5730 | 5975 | 6220 | 6464 | 6709 | 6954 | 798 | 7443 | 68 | 93 |
|  | 0770 | 065 | 0537 | 0421 | 030 | 0188 | －071 | 9954 | 9838 | $84 \cdot 9721$ | 39.9738 | 9985 | ＋233 | 0480 | 0727 | 0975 | 1222 | 1469 | 1716 | 196 | 析 |
| 95 | 9821 | 9703 | 95 | 9468 | 9350 | 923 | 9114 | 8996 | 878 | 85.8760 | $40 \cdot 3990$ | 4240 | 4490 | 4740 | 4990 | 5240 | 5490 | 5740 | 5990 | 62 | 95 |
| 96 | 8872 | 8753 | 8634 | 8515 | 8396 | 82721 | ， |  | 7919 | $86 \cdot 7800$ | $40 \cdot 8243$ | 8495 | 8748 | 9001 | 9253 | 9506 | 9759 | 0011 | 026 | 051 | 96 |
| 97 | 792 | 780 | 768 | 7562 | 7442 | 7321 | 724 | 7081 | 6960 | 87.6839 | 41.2495 | 2751 | 3006 | 3261 | 3516 | 3772 | 4027 | 4282 | 4537 | 479 | 97 |
| 98 | 6973 | 6852 | 6731 | 6609 | 6488 | 6366 | 6244 | 6123 | 6001 | 88.5879 | 41.6748 | 7006 | 7264 | 7522 | 7779 | 8037 | 8295 | 8553 | 881 | 906 | 98 |
|  | 6024 | 4951 | 5779 4827 | 5656 | 5533 | 5411 | 5288 | 5165 | 5042 | 89.4919 | $42 \cdot 1000$ | 1261 | 1522 | 1782 | 2043 | 2303 | 2563 | 2824 | 8084 | 3345 | 98 |
|  | 5075 | 4951 | 4827 | 4703 | 4579 | 4455 | 4331 | 4207 | 4083 | 90－3958 | 42.5253 | 5516 | 5779 | 6043 | 6306 | 6569 | 6832 | 7095 | 7358 | 7621 | 100 |
|  | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | $46^{\prime}$ | $45^{\circ}$ | $44^{\prime}$ | $43^{\prime}$ | $42^{\prime}$ | $41^{\prime}$ | $60^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | $47^{1}$ | $46^{\prime}$ | $45^{\prime}$ | $44^{\prime}$ | $43^{\prime}$ | 42 | $1{ }^{1}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $64^{\circ}$ |

TRAVERSE TABLES.

|  | $5^{\circ}$ Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 038 |  | 036 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }_{6}^{6148}$ |  |  |  |  |  |  |  |  |  |  |  | 7147 |  |  |  |  |  |  |  |
|  | 64230 | ${ }^{4223}$ | 4215 | 4208 | ${ }^{4200}$ | 4193 | 4185 | 78 |  | 5.463 | 2.5 | 5688 | 705 | 5720 | 5736 | 5752 | 768 | 5783 | 5799 |  |  |
|  |  | 3260 | ${ }^{3258}$ | ${ }^{3242}$ |  | ${ }_{2255}^{3225}$ | 3216 |  |  |  |  | 42422 | 929 | (107 294 | ${ }^{0025}$ |  |  |  | O0999 |  |  |
|  | 91345 | 1334 | 133 | 1311 |  |  | 1278 |  |  |  |  | 853 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\left\lvert\, \begin{aligned} & 12 \\ & 13 \end{aligned}\right.$ |  | 84 | 8430 | 84 | 8400 | ${ }_{838} 8$ |  |  |  |  |  | 1378 | 409 | 1441 | 1472 | 1504 | 1535 |  |  |  |  |
| $\left\lvert\, \begin{gathered} 13 \\ 14 \end{gathered}\right.$ |  |  |  | ${ }_{648} 6$ |  | ${ }^{7} 449$ |  |  |  |  |  | 5659 | $\left.\begin{array}{\|c\|c\|c\|c\|} \hline 99973 \end{array} \right\rvert\,$ | H27 |  |  |  |  |  |  |  |
|  |  | 5556 | ${ }_{538}$ | ${ }_{5519}$ | 5500 | ${ }_{5482}$ | 5463 | 544 | 5425 |  | 6.4 | 94 |  |  | 14360 | ${ }_{4380}^{038}$ | 4419 | 4458 | 4498 |  |  |
|  | ${ }^{6} 4613$ |  |  |  |  |  |  |  |  |  | 6.8 |  |  | ${ }^{8588}$ | 883 |  |  |  |  |  |  |
| $\left\|\begin{array}{c} 17 \\ 18 \end{array}\right\|$ | ${ }_{8}^{78595}$ | $\begin{aligned} & 3631 \\ & 2668 \end{aligned}$ | ${ }_{268}^{360}$ | ${ }^{35}$ | ${ }_{2600}^{357}$ |  |  |  | 2510 |  |  | 7066 | 7114 | $8874$ | 208 | 25 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 1539 |  |  | 1348 |  | ${ }^{1434} 5$ | 198 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\left\|\begin{array}{c} 23 \\ 23 \end{array}\right\|$ |  |  | 8789 |  |  |  | 8879 | 8651 | $8624$ |  |  | 析 |  |  | ${ }_{4}^{43665}$ |  | 4731 | 4 |  |  |  |
|  |  |  |  |  |  |  | 6741 |  | 6681 |  |  |  |  | 2881 |  |  |  | 31 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 736 | 743 |  |  |  |
| ${ }_{2}^{26}$ | 26 4993 | ${ }_{4}^{4964}$ | ${ }_{3983}^{4938}$ | ${ }_{393}^{498}$ | ${ }^{4887}$ 301 | ${ }_{3835}^{4835}$ | ${ }_{3838}^{4802}$ |  | ${ }_{3768}^{4737}$ |  |  | ${ }^{1318}$ | ${ }^{368}$ | ${ }^{1455}$ |  | 15883 | (1860 | 225 | 6096 |  |  |
| $\left.\begin{array}{\|c\|c\|} 28 \\ 28 \\ 00 \end{array} \right\rvert\,$ | ${ }^{2} 80$ | 30 | 302 | 29 | 2934 | 2899 | 3833 |  | $\begin{aligned} & 3766 \\ & 27964 \end{aligned}$ |  |  |  |  | 8028 | ${ }^{58122}$ |  | 024 | 525 | ${ }_{0} 0396$ |  |  |
| 22 | 150 | 111 | 1070 | ${ }_{1038}^{2003}$ |  |  |  |  | ${ }_{1822}^{1822}$ |  |  |  | ${ }_{452}^{423}$ | 3315 |  | 46 |  |  |  |  |  |
|  | 10188 | 0.150 | 011 | 007 | ${ }^{036}$ |  |  |  | 987 |  |  | 2725 |  | ${ }^{2888}$ |  |  |  | 3214 | ${ }^{3296}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 43 | 726 | 721 | 717 | 73 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | t03 |  |  |  |  |  |  |  |
|  | ${ }^{5} 5$ |  | 532 | ${ }_{428}^{528}$ |  |  |  |  | 5021 |  | ${ }^{5} 5.4038$ |  |  |  | 447 | ${ }^{4511}$ | 4606 | 4700 | ${ }^{4795}$ |  |  |
|  | ${ }^{8} 84$ | 341 | 336 | ${ }_{3}^{423}$ | ${ }_{3267}$ | ${ }_{322} 4$ | 41 | 4295 | ${ }_{3078}$ |  |  |  | 2796 | $8$ | 995 |  | 3195 |  | 3395 |  |  |
| 40 | ${ }_{15}$ |  |  |  |  |  | 1234 | ${ }_{1184}^{2155}$ | ${ }_{1134}^{2106}$ |  | ${ }^{16} 17.7875$ | 125 |  |  | ${ }_{1}^{2285}$ |  | ${ }_{1784} 74$ | 188 | 199 |  |  |
|  | 1057 | 05 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{43}^{42}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{45}$ |  |  |  |  |  |
|  | 476 |  | 757 |  | 746 | ${ }^{3} 413$ | 735 | ${ }^{273}$ | 72 |  |  | ${ }_{8395}^{4103}$ | $\left.\begin{aligned} & { }_{8}^{8550} \\ & 05010 \end{aligned} \right\rvert\,$ | 861 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 55 | 57 |  |  | 5534 | 5477 | 5419 | 5362 | 53 |  |  | 6997 |  |  |  |  |  |  |  |  |  |
| ${ }_{4 B}^{47}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 49 |  |  |  |  |  |  |  |  |  |  |  | 292 | 992 | 4048 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 0, |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3933 | 896 | 8900 | 883 | 876 | 870 | 8835 | 8569 | 8503 |  |  | 6918 | 7057 |  | 7336 |  |  |  |  |  |  |
| ¢ 54 |  | 704 | 7936 |  |  |  | ${ }_{6697}^{7666}$ | ${ }_{\text {ck }}^{7598}$ |  | 496 |  | 548 | ${ }_{5625}^{1334}$ | ${ }_{5}^{1870}$ | ${ }_{591}^{162}$ | 60 | 620 |  |  |  |  |
|  | 66147 |  | 600 | 593 | 5868 |  | 5728 | 5658 | 5588 |  |  |  |  | P056 | 0204 |  |  |  | 0792 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{4} 893$ |  |  |  |  |  |  |  |  |
|  |  | 318 | 311 | 304 | 2968 | 2894 | 2821 | 2747 | 26 | 53.2 |  |  | 276 |  |  |  | 338 | ${ }^{353}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 55.873 | 888 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 1035 |  |  | ${ }^{1880}$ | 075 |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 02 \\ & 68 \\ & 646 \\ & 64 \end{aligned}$ | 394 | 933 | 92 | 918 | 910 | 9023 | 894 |  |  |  |  | 973 | 9898 | +064 | 022 | 95 | 0560 |  | 0891 |  |  |
| ${ }_{65}^{64}$ | 4 | ${ }^{837}$ | ${ }^{823}$ | ${ }^{82}$ | 71785 | ${ }_{7085}^{8055}$ | 7975 | 7895 | ${ }_{688} 78$ |  |  | ${ }_{8295}^{4014}$ | ${ }_{8}^{4186}$ | ${ }_{8637}$ |  |  |  | ${ }_{9320}^{5023}$ |  |  |  |
|  | 665 |  | 636 | ${ }^{6284}$ | 62 |  | 6036 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 210 |  |  |  |  |  |  |  |
| 69 | 563 | 355 | 4 | ${ }_{338}^{433}$ |  | ${ }^{42153}$ | 4098 | ${ }^{4013}$ | ${ }^{322}$ |  |  | ${ }^{5} 1742$ | ${ }_{563}^{1378}$ |  |  | 1885 |  | ${ }^{225}$ |  |  |  |
| 70 |  |  |  |  |  |  | 2160 |  | 1985 | ${ }^{631} 1897$ |  | $2{ }^{2}$ | 887 | 071 |  |  |  |  |  |  |  |
|  |  | 1634 |  | 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\left.\begin{aligned} & 74 \\ & 75 \end{aligned} \right\rvert\,$ |  |  | 855 |  |  | 8376 | 8283 | 8191 | 809 |  |  | 682 |  |  | 74 | 760 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5952 |  | 57 |  |  |  |  | 5280 | 5 |  |  | 9673 |  |  |  |  |  |  |  |  |  |
| $79$ | 7894929 |  |  |  | ${ }_{\text {a }}^{4602}$ | ${ }^{45504}$ | 44 | 4399 | ${ }_{422}^{42}$ |  |  | 238 | 4159 | ${ }^{436}$ |  | 47 |  |  |  |  |  |
|  |  | 296 |  |  |  |  |  |  |  | ${ }_{72}{ }^{2}$ |  | 223 | 274 | ${ }_{293}$ |  |  |  |  |  |  |  |
|  |  | 20 | 1903 | 18 | 1702 | 1601 | 1499 | ${ }^{1398}$ | ${ }^{12297}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{gathered} 83 \\ 8 \\ 88 \\ 88 \end{gathered}$ |  | 9116 |  |  | 8802 | 8897 | ${ }^{8592}$ | ${ }^{8887}$ | ${ }^{838}$ |  |  | 964 | ${ }^{88}$ | +08 | 030 | ${ }^{552}$ |  |  |  |  |  |
|  |  | 815 |  | 794 |  |  |  | 7517 |  | 76 | 3370 | 392 | 148 |  |  | 8818 |  |  |  |  |  |
|  |  |  | 611 | 50 |  | 5793 | 54 | 5576 | 54 |  |  | ${ }_{248}^{820}$ | ${ }_{\text {a }}^{8716}$ | ${ }_{29}^{895}$ | ${ }_{\text {l }}^{8174} 8$ | ${ }_{3462}^{9110}$ |  |  |  |  |  |
| $878888888_{87}^{878}$ | 85374 | ${ }_{5264}$ | 515 | 50 | 4935 | 4825 | 15 | 4605 | 5.23 |  | 37. | 67 | 7000 |  | 746 | 769 |  | 8157 | ${ }_{83}$ |  |  |
|  |  |  | 4190 |  |  |  | 3776 | 3635 |  | ${ }^{80} 8.341$ |  | 105 |  |  | 1752 | 1986 |  |  |  |  |  |
|  | 12689 | ${ }^{237}$ | ${ }^{226}$ | 214 | 203 | 1922 | 1808 | 169 | 1580 | 82 |  | 9613 |  | +092 |  |  |  |  |  |  |  |
| $\begin{aligned} & 92 \\ & 93 \end{aligned}$ |  | 14 | 125 | 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 913 | 9018 | 8900 | 873 | 866 |  |  | 2458 | 270 |  |  | 3446 |  |  |  |  |  |
|  | 5864 | 852 | 8405 | 8287 | 8169 |  | 7931 | 7813 | 76 | 85 | $40 \cdot 649$ | 6739 | 698 | 7239 | 7488 | ${ }_{738}$ | 7988 | 8237 | 8487 |  |  |
|  |  |  | 74 | 732 | ${ }^{223}$ |  |  | (6882 | 57 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }_{563}^{559}$ | ${ }_{5513}^{647}$ | 635 | ${ }_{5259}^{5235}$ | ${ }_{5}^{614}$ |  | 5920 | 47 |  |  | 535 | 984 | 109 |  | 061 |  | ${ }_{123}^{238}$ | 1386 |  |  |
|  | 47 |  |  |  |  |  |  |  |  | 89.3 |  |  |  |  | 4645 |  |  |  |  |  |  |
|  |  |  |  |  | $13{ }^{\prime}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

|  |  | osine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | 134， 36 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ${ }^{9023}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 008 6 |  |  |  | 10278 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1381 | ${ }^{312}$ | 3163 | ${ }^{3} 1555$ | 1366313 | 31373128 |  |  |  |  | 0.154 | 0173 | ¢191 | 2098022 | 2288 |  |  |  |
|  | 2073 | ${ }^{12122}$ 212 |  | ${ }^{21729} 121$ |  | $\underbrace{21575}$ |  |  |  | 发3．846， |  |  |  |  |  |  |  |  |
|  |  | 2271 | 1225 |  | 2292921 | 2151202 |  |  |  |  | 1335 |  |  | ${ }^{7772} 7^{750}$ | ${ }^{501} 75329$ | ${ }^{7558}$ | ${ }^{3587}$ |  |
|  |  | ${ }_{\text {ciza }}^{8235}$ | ${ }^{2380}$ |  | ${ }^{205}$ |  |  |  |  | s．1．586 |  |  | ${ }^{1756}$ 606 |  | （139 |  |  |  |
|  | 6362 |  |  |  |  | 6274 |  | 6231 |  | coicle |  |  |  |  | Stic | （ose |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 337 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 14917 | ， |  |  | － 13 | （1322 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 9517］ 98 | P480 9 | ${ }^{96644^{29}}$ | ${ }^{933585}$ | ${ }^{9441 / 19885}$ |  |  |  |  | 4732 |  |  |  |  |  |  |  |
|  |  |  | ${ }^{81537}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | coicise |  |  |  | ${ }_{6470} 6450$ |  |  |  |  | 3386 |  | ， 312 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 36643 | 3630 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1750 | 1731 | 1671 | ${ }^{1} 1861$ | 58 | S 58 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ${ }^{9224}{ }^{\circ}$ |  | 28 | ${ }^{2607}$ |  |  |  |  |  |  |  | ${ }^{784}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Sig9 |  |  | （tis） |  |  | 6580 | ${ }_{\text {cis }}^{5538}$ |  |  | ${ }_{6}^{643}$ |  |  | ${ }^{6} 1061$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | $5 \cdot 48$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 速 1034 | （1） |  | ｜ise | ${ }_{\substack{1831 \\ 083 \\ 183}}$ |  |  | ， |  | ${ }^{6} 7839$ |  |  |  |  |  |  |  |  |
|  |  | 2009 ${ }^{20}$ | ${ }^{9957}$ | ${ }^{2906}{ }^{208}$ | 9835 | ${ }^{9883}$ |  | Sod |  |  | 16817 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1736 | 7082 | 边 | cep |  | coick | 67 | － 1890 |  |  |  |  |  | 8887 | 0020118 | 0233 |  |  |
|  | 895 | 51325 | 507450 | 501649 | 495949 |  |  |  |  |  |  |  | 38． |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 20， | ${ }_{\substack{2025 \\ 1230}}^{211}$ | 1216 |  | ， |  |  |  |  |  | 1070 |  |  | 1465159 |  |  |  |  |
|  |  |  | 0,1910 | 01270 | 10038 | 929989 9393 |  |  |  |  |  |  |  |  | 12300364 | 0.48 | ${ }^{063}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ［3362 |  |  |  | ${ }_{6} 6$ | ${ }_{\text {cose }}^{6008}$ | cose | ${ }_{\text {cose }}^{5885}$ | 边 |  | ${ }_{\text {cose }}^{2025}$ |  |  | ${ }_{30,3}^{31818}$ | 退 | 3663 |  |  |
|  |  |  | 153075 | 5237 51 | 5167509 |  |  | L4885 |  |  | 1233 | ${ }^{31380}$ |  |  |  |  |  |  |
|  |  |  |  |  | ${ }^{12888}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{2} 5612$ | ${ }^{2337} 2$ |  | 2029215 | 2155 208 |  |  | 3518， |  | ${ }_{4156}$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{\text {a }}$ | ${ }_{\text {a }}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }_{659} 7$ | ${ }_{651}$ |  | ${ }_{\text {c354 }}^{7334}$ | $3{ }^{3} 7173$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }_{5}^{52524}$ | ${ }^{555454} 5$ | 5458 | ${ }^{53375}$ | ${ }^{52322} 5$ |  | 6503 |  |  | 4311 | － | ${ }^{6657}$ |  |  |  |  |  |
|  |  | ${ }^{3673}$ | ［388］ |  | 3417） 333 | ${ }^{3332}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{1886}$ | 9771 |  |  | ${ }_{\text {a }}^{0.5599}$ | $\underbrace{0390}_{0} 0$ |  | ${ }^{01238}$ |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{8726}$ | ${ }^{8770484} 8$ | ${ }^{8613} 8$ | ${ }^{85212} 8828$ | ${ }^{822929} 83838$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 939 | 6 | ${ }^{6251}$ |  | ${ }_{6553} 5646$ | 64 |  | 6186 | 67\％09 |  |  | 287 |  |  |  |  |  |  |
|  |  | ${ }_{\text {c }}^{5898}$ | ${ }_{4}^{5778}$ |  |  |  |  |  |  |  | ${ }^{3688}$ |  |  | 3302200 |  |  |  |  |
|  |  |  |  |  |  | ${ }^{3527} 32329$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ${ }_{1889}^{12848}$ |  |  | ${ }^{236}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{0.924}$ | ${ }^{0983}$ | ${ }^{08914} 9810$ |  |  |  |  |  |  |  |  |  |  |  | \％os |  |  |  |
|  | ${ }_{172}^{148}$ |  |  | ${ }_{8}^{8834} 88$ | ${ }^{8730} 888$ | ${ }^{8} 88258585858$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ． |  | 8 | ${ }^{\text {c64 }}$ | ${ }_{\text {cisi }}^{4}$ |  |  |  |  |  | ${ }^{2}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | ${ }^{0.435}$ | 53 ${ }^{\text {gool }}$ |  | ${ }_{\text {l }}^{1 / 458}$ |  |  |  |  |
|  |  |  |  |  |  |  |  | ${ }^{339}$ | ${ }^{78.3220}$ |  |  |  |  |  |  |  |  |  |
|  |  |  | 2101 |  | 17 | ${ }_{178}^{238}$ |  |  |  |  |  |  |  | ${ }_{8}^{2085}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | ${ }^{8388} 8888$ |  |  | 8870 |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ${ }^{21218}$ | \％ |  | 1880 |  |  |  |  | 4027 |  |  | ${ }_{\text {cosem }}^{5689} 5$ | $5923$ | ${ }^{60737} 0$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 4288 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ${ }_{2355}^{3315}$ | ${ }_{2080}^{3280}$ | ${ }^{3085}$ |  | 0 |  |  |  |  |  |  |  |  | ${ }_{\text {cose }}^{8025}$ | 288 |  |
|  |  |  |  |  | ${ }^{126}$ ¢28 | ${ }^{25^{5}}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.

|  | $25^{\circ}$ Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\circ}$ |  |  |  | ${ }^{44^{\prime}}$ |  |  |  |  |  | $40^{\prime}{ }^{\prime} / 41^{\prime}$ |  | $1^{1} 42^{\prime}$ | ${ }^{4}{ }^{\prime}{ }^{\prime}$ | ${ }^{44^{\prime} T 4}$ |  |  |  | ${ }^{48^{\prime} \backslash 49^{\prime}}$ |  |  |
|  | ${ }_{1}^{1}$ |  |  |  | 9088 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | ${ }_{7025}$ | 3812 | ${ }_{7017}^{8017}$ | ${ }_{7}^{8013}$ |  |  |  |  | ${ }^{8017}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 6013 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 14 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 469 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 12 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 12 | 814 |  | 1 | ${ }_{8099}$ | 8084 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 7140 | 24 | 7107 |  |  | 705 | 70 |  | 5.6308 | 634 | 637 | 6410 | 6444 |  | 65 |  |  |  |  |
|  |  | ${ }_{5180}^{168}$ |  |  |  |  |  | 506 | ${ }_{504}^{504}$ |  |  | 067 | ${ }_{5} 071$ | 744 |  |  | ${ }_{\substack{085 \\ 525}}$ |  |  |  |  |
|  |  |  |  |  |  | $41 / 2$ | 4091 | 407 | 4051 |  | 6.9302 | 9344 | 1938 | 9427 | 946 | 9511 |  | 25 | 9637 |  |  |
|  |  |  |  | 31 | 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 0165 |  | 1112 |  |  |  |  | ${ }_{667}^{234}$ |  | 5784 |  | 2589 |  |  |  |  |  |
|  | 2129279 |  | ${ }^{9226}$ | 92 | 9 | 9 | ${ }^{120}$ |  |  |  | 9.0958 | 101 | 1068 | ${ }^{1123}$ | 1178 | 1234 | 1289 | 344 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 6168 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 57 | 5143 |  | 5088 |  |  | 834 |  | 848 |  | 261 | 8677 |  |  |  |  |
|  |  |  |  |  |  |  | 414 | ${ }^{11}$ | 408 |  | $1 \cdot 2$ | 268 |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{2335}$ | 2392 | ${ }^{3257}$ | 322 | 189 |  | 3120 |  |  |  | ${ }_{135} 7$ | 142 | 7159 |  | 1645 |  |  | ${ }_{65}{ }^{2}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 9334 | 9235 | ${ }^{2356}$ | 9210 |  |  |  |  |  |  | 4434 |  |  |  |  |  |  |  |  |
|  | 3288439 | 739 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 744 | 75 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7739 | 344 | 3398 | ${ }_{335} 3$ | 3305 | 325 | 32 | 316 | 311 |  |  | 0337 | 0454 | 0551 |  | $\left.\begin{array}{l} 800 \\ \hline 154 \\ \hline 104 \end{array}\right\}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{14681}$ |  | 0380 |  |  |  | 178 | 128 |  |  |  |  |  |  | 9, 9 | 235 |  |  |  |  |
|  | 129545 |  | 9462 | 9330 | ${ }_{8336}^{9388}$ |  | ${ }^{2326}$ | 918 | 9 |  |  | 7693 |  |  |  | ${ }^{123}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 6474 | 641 | 636 | 630 | 62 | 612 | 514 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 538 |  | 18 |  |  |  |  |
|  | ${ }^{6625}$ | ${ }_{3553}^{4553}$ | ${ }_{3506}^{4495}$ | 444 | ${ }^{43388}$ |  | ${ }_{326}^{426}$ |  |  |  |  |  |  | ${ }^{9604}$ |  |  |  |  |  |  |  |
|  |  |  |  | 245 | 2396 | 23 | 227 | 221 | 21 |  |  | 8381 | 56 | ${ }^{3232}$ |  |  | $\left[\begin{array}{l} 4859 \\ \hline 8359 \end{array}\right.$ |  | $\left\|\begin{array}{l} 4959 \\ 8911 \end{array}\right\|$ |  |  |
|  |  |  |  | 146 |  | 1342 | 128 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 9614 |  |  |  | ${ }^{336}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 671 | 665 | 6582 | 651 | 64 | ${ }^{733}$ | ${ }^{63}$ | ${ }^{2} 22$ | 617 |  |  |  | 4176 |  |  |  |  | 488 |  |  |  |
|  |  | 566 | 5592 | ${ }_{5523}$ | 5454 | 5384 |  | ${ }_{24}$ | 517 |  |  | ${ }_{8368}^{408}$ | 4 | 35 | O1 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2771 |  |  |  | ${ }^{3478}$ | 240 | ${ }^{333}$ | 323 | 31 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{788}$ | (777 |  | 65 |  |  |  | ${ }_{628} 7$ | 62 |  |  |  | ${ }^{325}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | ${ }_{537}$ | ${ }_{528}$ | 52 | 58.5 |  |  |  |  |  |  |  |  |  |  |  |
|  | 4891 | ${ }_{3806}^{4796}$ | ${ }_{3722}^{4711}$ | ${ }^{463}$ | ${ }^{45554} 4$ | ${ }_{3468}^{4661}$ | 3383 | ${ }_{329}^{429}$ | ${ }_{3214}^{4210}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 29 | 28 | 273 | 26 | 256 | 247 | 2389 | 230 | 2217 |  |  |  | 88 | 5066 |  | 5423 | 560 | 5779 |  |  |  |
|  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |  |  |  |  | 122 |  |  |  |
|  | 294 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 551 | 642 | 6330 | 623 | 66:61 |  |  |  |  |  | 1490 | 1883 | ${ }_{187}^{1588}$ |  |  |  |
|  | 5599 |  | 5808 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\left.\begin{aligned} & 75 \\ & 77 \\ & 77 \\ & 79 \\ & 88 \\ & 80 \end{aligned} \right\rvert\,$ |  | 4914 | 481 |  | ${ }^{4627} 5$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 293 | ${ }^{388}$ |  | ${ }^{36353}$ | ${ }^{\text {2538, }}$ | ${ }^{3446}$ | ${ }^{3343}$ 334, | ${ }_{224}^{324}$ |  |  |  |  | 41 | ${ }_{862}^{432}$ | 452 | ${ }^{4725}$ | 4296 |  |  |  |
|  |  |  |  |  |  |  |  | 135 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 9983 | ${ }_{888}^{98}$ |  |  |  |  |  |  |  |  |  |  |  | 1688 |  | 2113 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 688 | 637 |  |  |  |  |  | 459 |  |  | 515 |  |  |  |  |
|  | ${ }^{6130} 5$ | 503 | 492 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 415 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8195 | 8423 | 865 |  |  |
|  |  |  |  |  |  |  |  |  | 2281 |  |  | 1389 |  |  |  | 5 | 254 |  |  |  |  |
|  | (196 | 1083 |  |  | 074 |  |  |  | ${ }_{0287}^{2284}$ | ${ }_{81}^{81} 0$ |  | 205 |  |  |  |  |  |  |  |  |  |
|  | 12 | +0, | 9989 |  |  |  |  | 9 |  |  |  | ${ }_{8725}^{4391}$ |  |  |  |  | ${ }^{5589}$ 931 | ${ }_{1}^{5822}$ |  |  |  |
| 92 | 2 | 91 | 89 | ${ }_{78}^{88}$ | ${ }_{7767}^{875}$ |  | 7532 | ${ }_{7} 841$ | 729 |  |  | 305 | 3303 | 3547 | 3790 | 4034 | 4278 | ${ }_{452}{ }_{4} 17$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 7393 |  | 788 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 289 | 416 | ${ }_{40} 5$ | 322 | ${ }^{479} 8$ | ${ }_{3670}^{4670}$ | ${ }_{355}^{453}$ |  | ${ }^{430}$ |  |  |  |  |  |  |  | ${ }^{3366}$ | 70 | ${ }^{822}$ |  |  |
|  | ${ }^{3303}$ | 317 | 305 | 2932 | 2888 | ${ }^{2688}$ | 256 | 2436 | 2312 |  |  | 472 |  |  | 550 | 5756 | 6013 |  | ${ }_{652} 6$ |  |  |
|  |  |  |  | 095 |  |  |  |  | 1316 | 39.190 |  |  | 9323 |  |  |  |  |  |  |  |  |
|  | $0^{\prime}$ |  |  |  |  | 15 |  |  |  | $11^{\circ}$ |  |  |  |  |  | ${ }^{5}$ |  |  |  |  |  |
|  | Sine. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES

| $25^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $25^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | 52＇ | $53^{\prime}$ | 54 | $55^{\prime}$ | $56^{\prime}$ | 57 |  |  |  | 51 | $52^{\prime}$ | $53^{\prime}$ | 54 | $55^{\prime}$ | $56^{\prime}$ | 57 | $58^{\prime}$ |  |  |
|  | 900 | 899 | 8998 | 8997 | 89 | 8994 | 89 | 8992 | 8990 | －8989 | 4358 | 4360 | 4363 | 4365 | 4368 | 1 | 4373 | 4376 | 4378 | 1 |  |
|  | 800 |  | 79 | 79 | 799 |  |  |  |  |  |  | 872 | 8726 | 873 | 87 | 8741 | 8747 | 8752 | 8757 | 3762 |  |
|  | 700 | 699 | 6994 | 69 | 6987 | 698 | 69 | 697 | 697 | $2 \cdot 69$ | －3073 | 308 | 3088 | 309 | 3104 | 3112 | 312 | 312 | 3135 | 3143 |  |
|  | 6003 | 5998 | 5 |  | 59 |  |  |  |  | $3 \cdot 595$ | 7430 | 744 |  | 74 |  | 7483 | 749 | 7503 | 7514 | 7524 |  |
|  |  |  |  |  |  |  |  |  | 4952 | 4.494 | －1788 | 1801 | 1814 | 1827 | 1840 | 1853 | 1866 | 1879 | 1892 | 1905 |  |
|  | 40 | 3996 | 3989 |  | 3973 | 3966 | 3958 | 3951 | 3943 | 5.393 | $2 \cdot 6145$ | 616 | 6177 | 6192 | 6208 | 6224 | 6240 | 6255 | 6271 | 6287 |  |
|  | 300 |  |  | 29 | 29 | 2960 |  |  |  |  |  | 05 | 05 | 05 | 05 |  | 0613 | 0631 |  | 066 |  |
|  |  |  |  |  |  |  |  |  |  | 7•191 | $3 \cdot 4860$ | 488 | 4902 | 4923 | 49 | 4965 | 4986 | 5007 | 5028 | 5049 |  |
|  | 100 | 0994 |  |  |  | 09 |  | 09 | 99 |  | 3.9218 | 924 | 9265 | 92 | 93 | 933 | 93 | 93 | 9406 | 9430 |  |
| 10 | －007 | 9994 | 981 | 9968 | 956 | 9943 | 9930 |  | 9905 |  | 4．3575 | 3602 | 362 | 36 | 368 | 370 | 373 | 3759 | 3785 | 3811 | 10 |
| 11 | 9007 | 8993 | 8979 |  |  |  |  |  |  | 9．888 | 4.7933 | 7962 |  |  |  | 8077 |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  | $10 \cdot 78$ |  | 2322 | 23 |  |  | 2448 |  |  |  | 257 |  |
| 13 | 70 | 69 | 6976 | 69 | 69 | 69 | 69 | 68 | 687 | 11 | 510 | 6682 | 67 | 67 | 67 | 681 | 68 | 6886 |  | 695 | 3 |
| 14 | 60 |  |  |  | 5938 |  |  | 385 | 5867 | 12 |  | 104 | 107 | 11 | 11 | 1189 | 1226 | 1262 | 1299 | 1335 | 14 |
| 15 | 5010 | 4991 | 4972 | 4953 | 4934 | 4915 | 4896 | 376 | 4857 | 13.4838 | 6． 5363 | 540 | 5442 | 5481 | 5520 | 5560 | 5599 | 5638 | 5677 | 5716 | 15 |
| 16 | 40 | 3990 | 3970 | 3950 | 3929 | 3909 | 388 | 3868 | 3848 | 14．382 | 6.9721 | 97 | 9805 | 9846 | 9888 | 9930 | 9972 | ＋014 | 0056 | 0098 | 16 |
| 17 | 301 | 2990 |  |  | 29 |  | 288 |  |  | 15 |  | 4123 | 41 | 42 |  | 4301 | 43 |  |  | 4479 | 17 |
| 18 | 2012 |  |  |  | 19 |  | 1875 | 1852 | 1829 | 16.18 | 7.8436 | 848 | 85 | 8577 | 8624 | 8671 | 8719 | 8766 | 8813 | 8860 | 18 |
| 19 | 1012 | 0988 | 0964 | 0940 | 091 | 089 |  | 0843 | 0819 |  |  | 28 |  | 2943 | 2992 | 3042 | 3092 |  |  | 324 | 9 |
| 20 | －013 | 9988 | 9962 | 993 | 99 | 9886 |  | 9835 | 9810 | 17 | 8.7151 | 72 | 725 | 73 | 7360 | 44 | 46 | 7 1 | 7570 | 62 | 20 |
| 21 | 90 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 22 | 801 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 62 |  |  | 638 | 22 |
| 23 | 70 | 69 | 6957 | 6928 | 6898 | 6869 | 68 |  | 6781 | $20 \cdot 6$ | 10.0 | 02 | 03 | 04 | 04 | 0525 | 0585 | 06 | 0705 | 076 | 23 |
| 24 | 6016 |  |  |  |  |  |  |  | 5772 | $2 \cdot$ | 104 | 46 | 470 | 47 | 483 | 4895 | 495 |  |  | 5146 | 24 |
| 25 | 5016 | 498 | 495 | 4921 | 488 | 485 | 4826 | 4794 | 4762 | 2.47 | 10. | 900 | 907 | 913 | 9200 | 26 | 933 | 939 | 9462 | 952 | 25 |
| 26 | 401 | 3984 | 3951 | 3918 | 3885 | 3852 | 3819 | 3786 | 3753 | $23 \cdot 3720$ | 11 | 3364 | 343 | 3500 | 3568 | 3636 | 3705 | 3773 | 3841 | 3909 | 26 |
| 27 | 30 | 298 |  |  | 2881 |  |  |  |  |  | 117 |  |  |  |  |  |  |  |  |  | 27 |
| 28 | 20 |  |  |  | 1876 | 1841 |  |  |  |  | 12.20 |  |  |  |  | 23 | 245 |  |  |  | 28 |
| 29 | 1019 | 0982 | 0945 |  | 087 | 0835 |  | 0761 |  |  |  | 64 | 65 | 65 |  | 67 | 6824 |  | 6976 | 705 | 29 |
| 30 | －020 | 9982 | 9944 | 9905 | 9867 | 9829 | 9791 | 9753 | 9715 | 26.9676 | 13.0726 | 0805 | 08 | 0962 | 1041 | 111 | 19 | 1276 | 1354 | 1433 | 30 |
| 31 | 902 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 802 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 70 | 698 | 6938 | 68 | 6854 | 6812 |  |  | 6686 | 29.66 | 143799 |  | 39 | 4058 | 41 | 42 | 43 |  |  | 45 | 33 |
| 34 | 6022 |  |  | 5893 | 㖪 | 580 | 5763 |  | 5677 | 30.56 | 14 | 824 | 83 |  |  | 8602 | 86 |  |  | 895 | 34 |
| 35 | 5023 | 49 | 493 | 4890 | 45 | 801 | 4756 | 4712 | 4667 | 31．4623 | 15. | 260 | 269 | 2789 |  | 297 | 306 | 3155 | 3247 | 333 | 35 |
| 36 | 402 | 3978 | 3932 | 3887 | 3841 | 3795 | 3749 | 37 | 36 | 32．3612 | 15.687 | 6966 | 70 | 7154 | 7248 | 7343 | 7437 | 7531 | 7625 | 7718 | 36 |
| 37 | 30 | 297 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 18 |  |  |  |  |
| 38 | 20 | 197 | 1928 |  | 1832 | 178 |  |  | 1639 | $34 \cdot 15$ | 16.55 | 568 |  |  |  | 608 | 618 |  |  | 648 | 88 |
| 39 | 10 | 09 |  |  | 0828 | 0778 |  |  |  |  | 16.9 | 104 | 01 |  |  | 045 | 055 |  |  |  | 39 |
| 40 | － 026 | 9975 | 9925 | 9874 | 9823 | 9772 | 9721 | 9671 | 9620 | 35.9569 | $17 \cdot 4302$ | 4407 | 45 | 4616 | 4721 | 4825 | 4930 | 5035 | 5139 | 524 | 40 |
| 41 | 9027 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 802 |  |  |  | 7814 |  |  |  |  |  |  |  |  |  |  |  | 367 |  |  |  | 42 |
| 43 | 70 | 69 | 6919 |  | 6810 | 6755 |  |  |  | 38.65 | 18.73 | 74 | 76 | 77 |  | 79 | 805 | 81 |  | 83 | 43 |
| 44 | 602 | 597 |  |  | 5805 | 575 | 5694 | 563 | 55 |  |  | 18 |  |  |  |  | 2423 |  |  |  | 44 |
| 45 | 502 | 49 | 49 | 48 |  | 474 |  |  | 45 | 40.45 | 19. | 620 | 63 |  |  | 6679 | 679 |  |  | 7149 | 45 |
| 46 | 403 |  |  |  |  |  |  |  |  | 4 | 20.04 |  |  |  |  |  |  |  |  |  |  |
| 47 | 30 |  |  |  |  | 273 |  |  |  | 42.249 |  |  | 5051 |  |  |  | 554 |  |  |  |  |
| 48 | 20 | 19 | 19 | 1849 | 1788 | 1727 | 166 |  | 154 | 43 | 20.91 | 928 | 941 | 953 |  | 979 | 99 | －0．4 |  | 0293 | 48 |
| 49 | 103 | 09 |  |  |  | 072 |  |  |  |  |  | 364 | 377 |  | 40 | 41 | 428 |  | 45 |  | 49 |
| 50 | ＋033 | 9969 | 9906 | 9842 | 9779 | 9715 | 9652 | 9588 | 9524 | 44．9461 | $21 \cdot 7877$ | 8008 | 8139 | 8270 | 840 | 8532 | 8663 | 8793 | 8924 | 905 | 50 |
| 51 | 9033 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 80 |  |  |  |  |  |  |  |  | 46 |  |  |  |  |  |  | 740 |  |  |  | 52 |
| 53 |  |  |  |  | 67 | 6698 | 6631 |  | 64 | $47^{\circ} 64$ | 23.09 | 108 |  |  |  | 16 | 178 |  |  |  |  |
| 54 | 603 | 59 | 589 | 5830 | 5761 | 5693 | 562 | 555 | 5486 | $48^{\circ}$ |  | 544 |  | 573 | 58 | 60 | 615 | 62 | 643 | 657 | 54 |
| 55 | 50 |  | 48 | 4827 | 4757 | 4687 | 461 | 45 | 4477 | 49.44 |  |  |  |  |  | 03 |  |  | 0817 |  | 55 |
| 56 | 40 |  |  |  |  |  |  |  |  |  |  | 41 |  |  |  |  |  |  |  |  | 56 |
| 57 | 3037 |  |  |  |  |  |  |  |  | 51.23 |  |  |  |  |  |  | 927 |  |  |  |  |
| 58 | 203 | 19 | 1891 |  | 1744 |  | 15 | 152 | 14 | 52.1374 | $25 \cdot 2738$ | 289 | 30 |  |  | 34 | 364 | 矿 | 395 | 41 | 58 |
| 59 |  |  |  |  |  | 06 |  |  |  |  |  | 725 | 740 |  |  |  | 802 |  |  |  | 59 |
| 60 | ＋039 |  | 988 | 981 | 9735 | 9658 | 9582 |  | 942 | 53．9353 | $26 \cdot 1453$ | 1610 | 176 | 192 | 203 | 223 | 239 | 2552 | 270 | 286 | 60 |
| 61 | 9040 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 80 | 79 |  |  |  |  |  | 74 | 741 | 73 | $27 \cdot 01$ | 03 | 04 |  |  |  | 114 |  |  |  |  |
| 63 |  |  |  |  |  |  |  |  |  | 5631 | 27＊45 |  | 485 |  | 51 | 53 | 551 |  |  |  |  |
| 64 | 60 |  |  | 579 | 5717 | 5636 | 55 | 547 | 539 | 57.5310 | 27 | 905 |  |  | 95 | 972 | 988 | ＋05 |  |  | 64 |
| 65 | 50 |  |  |  |  |  |  |  | 4382 | 58.4 | $28 \cdot 324$ | 34 | 358 | 375 |  | 409 | 4261 | 4431 |  | 477 | 65 |
| 66 | 40 |  |  |  |  |  |  |  |  |  |  | 2171 |  |  |  |  |  |  |  |  |  |
| 67 |  |  |  |  |  |  |  |  |  |  |  | 213 |  |  |  |  |  |  |  |  |  |
| 68 | 20 | 195 | 187 | 17 | 169 | 161 | 1526 | 144 | 135 | $61 \cdot 12$ | 29.63 | 649 | 66 |  |  | 72 | 矿 |  |  |  | 68 |
| 69 |  |  |  |  |  |  |  |  |  | $62^{\circ} 02$ |  | 0851 | 103 |  |  | 157 | 7 | 935 |  | 22 | 69 |
| 70 | 0 | 99 | 9868 | 9779 | 969 |  | 9512 |  |  | 62.9245 |  | 51 |  |  | 57 |  | 612 |  |  | 667 | 70 |
| 71 | 90 |  | 8866 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 80 |  | 78 | 777 | 76 | 759 | 74 | 7407 | 731 | 64•722 | $31 \cdot 374$ | 393 | 412 | 43 | 44 | 46 | 487 |  |  | 54 | 72 |
| 73 | 70 |  |  |  |  |  |  |  |  | ． 62 | 31.8101 | 829 | 8483 |  |  | 906 | 2 | 943 |  |  | 73 |
| 74 | 604 | 5955 | 58 | 57 | 5673 | 5579 | 5485 | 5390 | 529 | $66 \cdot 52$ | $32 \cdot 24$ | 265 | 284 | 30 | 323 | 342 | 362 | 381 | 400 | 42 | 74 |
| 75 | 50 | 4954 | 4859 | 4764 | 4668 | 4573 | 44 | 438 | 428 | $67 \cdot 4191$ | 32.6816 | 70 | 72 | 740 | 7601 | 779 | 799 | 190 | 83 | 858 | 75 |
| 76 | 405 |  |  |  | 3664 | 3567 | 3471 | 337 | 327 | 68.3180 | 33．117 | 1373 |  |  |  |  | 23 |  |  |  | 76 |
| 77 | 305 | 295 | 285 |  | 1565 |  |  |  |  |  |  | 573 |  |  |  |  | 674 | 6942 |  |  |  |
| 78 | 205 | 195 | 185 | 17 | 1655 | 155 | 1457 | 1358 | 1258 | 70．1159 | 33．98 | －093 | 029 | 050 | 070 | 09 | 111 | 1318 | 152 | 172 | 78 |
| 79 | 1052 |  |  |  |  | 0550 | 0450 | 0349 | 249 |  |  | 445 | 4660 | 486 | 5073 | 528 | 548 | 569 | 590 | ¢ | 79 |
| 80 | －052 | 995 | 9849 | 9748 | 9646 | 9545 |  | 934 | 9239 | ．9137 | 34．86 | 8813 | 902 | 923 |  | 965 | 986 |  | 027 |  | 80 |
| 81 | 905 | 89 | ${ }^{8847}$ | 8745 | 8642 | 8539 | 8436 | 833 | 230 |  |  | 317 | 3386 |  |  |  |  |  |  |  |  |
| 82 | 805 |  | 7846 | 7742 | 7637 | 7533 | 7429 | 732 | 7220 | 73.711 | 35.7319 | 753 | 77 | 796 |  | 839 | 86 |  |  |  | 82 |
| 83 | 7054 | 69 | 6844 | 6738 | 663 |  | 6422 | 536 | 6211 |  |  | 189 | 211 | 232 |  | 7 | 析 | 硣 |  |  |  |
| 84 | 605 | 5948 | 58 | 5735 | 562 | 5522 | 5415 | 5308 | 5201 | 75.500 | $36 \cdot 60$ | 625 | 6474 | 669 | 6914 | 7133 | 735 | 757 | 77 | 801 | 84 |
| 85 | S056 | 4948 |  | 4732 | 4624 | 4516 | 4408 | 4300 | 4192 | $76 \cdot 408$ | 37．039 | 061 | 0837 | 105 | 1282 | 150 | 172 | 19 | 2171 | 239 | 85 |
| 86 | 405 | 2947 |  |  |  |  |  |  |  |  |  | 4974 | 5199 |  | 5650 |  | 6100 | 6324 |  |  | 86 |
| 88 | 305 | 294 | 2836 | 2726 | 261 | 250 | 23 | 228 | 1173 | 10 | 39348 | 938 | 598 |  | ， | 22 | 4 |  | 092 |  | 87 |
| 88 | 2058 |  |  | 27 | 1611 | 1499 | 1387 | 1275 | 1163 | 79．105 | 38．3464 | 369 | 392 | 415 | 4386 | 4616 | 484 | 50 | 53 | 55 | 88 |
| 89 | 1058 |  | 32 | 0719 | 0606 | 0493 | －380 | 267 | 154 | 1021 |  | 805 | 828 | 852 | 8754 | 898 | 219 | 445 |  |  | 89 |
| 90 | －059 | 9945 | 31 | 9716 | 9602 | 9488 | 9373 | 9259 | 9144 | 80．9029 | 39．217 | 241 | 265 | 288 | 312 | 335 | 359 | 382 | 406 | 429 | 90 |
| 91 | 90 | 8944 | 88829 | 8713 | 8598 | 8482 | 8366 | 825 | 8134 | 81 | 39＇653 | 677 | 701 | 725 | 749 | 7728 | 796 | 820 | 84 | 868 | 91 |
| 92 | 806 | 69 | 7827 | 5707 | 7593 | 7476 | 7359 |  | 712 | 82－70 | 40.089 | 113 | 13 | 16 | 1858 | 2098 | 砛 | 2580 |  |  | 92 |
| 93 | 706 | 69 | 25 | 6707 | 6589 | 647 | 6352 | 623 | 6115 | ¢ |  | 545 | 573 | S98 | 62 | 468 | 10 | 139 | 157 | 744 | 93 |
|  | 6061 | 42 | 23 | 704 | 5584 | 5465 | 5345 | 522 | 5106 | 84．49 | 40.9610 | 985 | ＋10 | 03 | 05 | 0840 | 108 | 13 | 15 | 182 | 94 |
| 95 | 5062 | 4942 | 4821 | 4701 | 4580 | 5 | 4338 | 4217 | 4096 | 85•3975 | 41 | 421 | 446 |  | 4962 | 5210 | 545 | 5707 |  |  | 95 |
| 96 | 4063 | 41 | 19 | 97 | 3575 | 3453 | 33 | 220 |  |  |  |  | 析 | 析 | 9330 | 5951 | 兂 | ， |  |  | 96 |
|  | 3063 |  | 2817 | 1 | 2571 | 244 | 2324 | 220 | 2077 | 87•1954 | $42 \cdot 2682$ | 2936 | 319 | 344 |  | 395 | 42 | 445 | 471 | 49 | 97 |
|  | 20 |  |  | 1691 | 156 | 442 | 17 | 193 | 1068 | 88.0943 | 42.7040 | 729 | 755 | 780 | 8066 | 832 | 857 | 883 | 90 | 9348 | 98 |
|  | 1065 | 0939 | 0814 | 688 | 0562 | 0436 | 0310 | 0185 | 058 | 8.9932 | 437397 | 65 |  | 砣 | 2434 | 2693 | 295 |  |  |  | 99 |
| 100 | ． 06 | 星 | 8 | 9685 | 558 | 943 | 9304 | 9176 | 049 | 89.8922 | 43.5755 | 6017 | 6278 | 6540 | 6802 | 7063 | 7325 | 7587 | 7848 | 8110 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | 7 | $6^{\prime \prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ | ${ }^{\prime}$ | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ |  |  |
| 64 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $26^{\circ}$ |  |  |  |  | Cosing． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $26^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 0 | 1 | 2 | ${ }^{\text { }}$ | $4^{\prime}$ | $\mathrm{B}^{\prime}$ | 6 |  | $8^{\prime}$ |  |  | $1^{\prime}$ | 2 |  | S | $5^{\prime}$ | 6 |  |  |  |  |
|  | 898 | 8987 | 8985 | 8984 | 8983 | 8982 | 8980 | 8979 | 8978 |  |  |  |  | 339 |  |  |  |  |  |  |  |
|  |  | 797 | 797 |  |  |  | 7961 |  |  | 179 |  | 877 | 8778 |  |  |  |  | ${ }_{2 x}^{2}$ |  |  |  |
|  | 6964 | 6960 | 69 | 6952 | 693 |  | 6941 | 6937 | 693 | $2 \cdot 692$ | ． 31 | 315 | 316 | 3175 | 3182 | ${ }^{319}$ | 3198 | 4 | ${ }_{3214}^{8809}$ |  |  |
|  |  |  |  |  | 593 |  | 5921 | 5916 | 591 | 3.5906 | 75 | 7545 | 7556 | 7566 | 7577 | 7587 | 7598 | 7608 | 7618 |  |  |
|  |  | 4933 |  |  |  |  |  |  | 4889 | 4.4 | 2.1919 | 1932 | 1945 | 1958 | 1971 | 1984 | 1997 |  |  |  |  |
|  | 392 | 3920 | ${ }^{3912}$ | 3905 | 3897 | 3889 | 3882 | 3874 | 3866 | $5 \cdot 38$ | 2.6302 | 6318 | 6334 | 6349 | 6365 | 638 | 6396 | 641 | 6428 | 16443 |  |
|  |  | 29 | 2898 | 2889 | 2880 | 2871 | 2862 | 2853 | 2844 | 6．2835 | ． 0686 | 0704 | 0723 | 0741 | 59 | 0777 | 0796 | 0814 |  |  |  |
|  | 1904 | 18 | 18 | 1873 | 1863 | 1852 | 1842 | 1832 | 1822 | $7 \cdot 1811$ | $3 \cdot 5070$ | 5091 | 5112 | 513 | 5153 | 5174 | 5195 | 5216 | 5237 |  |  |
|  |  | 08 | 0869 |  |  | 咗4 | 0822 |  |  |  | 3.9453 | 947 |  | 95 |  |  | 959 | 9618 | 9642 |  |  |
| 10 | 寿 | 986 | 985 | 98 | 9828 | 9816 | 9803 | 9790 | 9777 | 8．9764 | $4 \cdot 3837$ | 3863 | 3889 | 391 | 3942 | 3968 | 3994 | 402 | 4046 | 4072 |  |
| 11 | 8867 | 8853 | 883 | 88 | 88 | 87 | 8783 | 8769 | 8755 | 9.8741 | 4＇8221 | ${ }^{8250}$ | 82 | 8307 |  |  |  |  |  |  |  |
| 12 | 785 | 78 | 78 | 78 | 779 |  | 7763 | 178 | 7733 | 10.77 | 5.2605 | 263 | 2667 | 269 |  |  |  |  |  |  |  |
| 13 | 6843 | 68 | 68 | 6793 | 67 |  | 67 |  | 6710 | 11.6 | $5 \cdot 6$ | 7022 |  |  | 71 | 7158 | 7192 | 722 | 72 | 7294 | 3 |
| 14 | 58 | 58 | 5795 | 5778 |  |  | 5724 |  |  | $12 \cdot 5$ | 6.1 | 1409 | 1445 | 1482 | 15 | 1555 | 159 | 162 | 1665 |  |  |
|  |  |  |  |  | 4743 | 4723 | 4704 | 4685 |  |  |  |  |  |  |  |  | 5991 | 6030 |  | 6108 | 15 |
| 16 |  |  |  |  |  | 3705 |  |  | 364 | 14 | 7.0139 | 10181 | ${ }^{0223}$ | ${ }^{2265}$ | 10307 | 10348 | 0390 | 0432 | 0474 | 0516 | 16 |
| 17 | 1783 | 17 | 27 | 2730 | 2708 |  |  | 2643 | 2621 | 1 | 7.4523 | 4568 | 4612 | 4656 | 4701 | 4745 | 4790 | 4834 | 4878 |  |  |
| 18 | 1783 | 17 | 1737 | 1714 | 1691 | 1668 | 1645 | 1622 | 1599 | 16.159 | 7.8907 | 8954 | 90 | 90 | 9095 | 9142 | 9189 | 9236 | 92 | 93 | 8 |
| 19 | 0771 | 0747 | 07 | 0698 | 0674 |  | 0625 | 0601 | 0577 | 17.0552 | $8 \cdot 3291$ | 334 | 3390 | 3440 | 348 | 35 | 358 |  |  |  |  |
| 20 | 975 | 97 | 9708 | 9682 | 9657 | 963 | 960 | 9580 | 9554 | 17.9529 | $8 \cdot 7674$ | 7727 | 7779 | 783 | 788 | 793 | 798 | 8040 | 8092 | 8145 | 0 |
| 21 | 8747 | 8720 | 86 | ${ }^{86}$ | 8640 | ${ }^{8613}$ | ${ }^{8586}$ | 855 | 8532 | 18.85 | 9．2058 | 2113 | 2168 | ${ }^{2223}$ |  | 2332 |  |  |  |  |  |
| 22 | 773 | 77 | 76 | 765 |  | 7594 |  | 7538 | 7510 | 1974 | ． 6442 | 64 | 6557 | 661 | 667 | 67 |  |  |  |  |  |
| 23 | 67 | 66 | 66 | 66 | 6605 |  | 6546 | 6517 | 6487 | 20 | 10．08 | 0885 | 0946 | 100 | 106 | 11 | 11 |  | 130 |  | 23 |
| 24 | 5711 | 56 | 56 | 56 | 5588 | 5557 |  |  | 5465 |  |  | 5272 | 5335 |  |  | 55 | 55 | 5648 | 57 |  | 24 |
| 25 | 469 | 4667 | 4635 | 4603 | 4571 | 4539 | 45 | 4475 | 4443 |  | 10 | 9658 |  |  |  |  |  |  |  |  |  |
| 26 | 3686 | 3653 |  |  | 3554 |  |  |  | 3421 | 23 | 11 |  | 4112 | 4180 | 424 | 4316 | 43 | 4452 | 452 | 4588 | 6 |
| 27 28 | 1662 | $\begin{aligned} & 2640 \\ & 1627 \end{aligned}$ | $\begin{aligned} & 2606 \\ & 1591 \end{aligned}$ | 15 |  |  | $14$ | $\begin{aligned} & 2433 \\ & 24312 \end{aligned}$ | 2398 1376 |  |  | 8431 2817 | 8501 |  |  |  |  |  | 89 |  |  |
|  |  |  |  |  |  |  |  |  | 0354 |  |  |  |  |  |  |  |  |  |  |  | 28 |
| 30 | 963 |  | 95 | 952 | 948 | 94 | 9408 | 9370 | 9331 | 26．9293 | $13 \cdot 1511$ | 1590 | 1668 | 1747 | 82 | 190 | 1982 | 20 | 21 | 22 | 30 |
| 31 | 8626 | 85 | 85 | 85 | 84 | 8428 | 8389 | 8349 | 8309 | 27．82 | 13＇58 | 5976 | 6057 | 613 | 621 | 630 |  |  |  |  | 1 |
| 32 | 7614 | 757 | 75 | 7492 | 7451 | 7410 | 7369 | 28 | 7287 | 28.7246 | 14.02 | 036 | 044 |  | 06 | 669 |  |  |  |  | 32 |
| 33 | 660 | 65 | 65 | 64 | 64 | 6391 | 6349 |  | 6265 | 29.6222 | 14.46 | 4749 | 483 | 492 |  |  |  |  |  |  | 33 |
| 34 |  | 55 | 55 |  | 54 | 5373 | 5329 | 52 | 5242 |  |  | 9135 |  |  |  |  |  |  |  |  |  |
| 35 | 4578 | 453 | 44 | 444 | 43 | 4354 | 4310 | 42 | 42 | 31.4 | 15 | 3521 |  |  |  |  |  |  |  |  |  |
| 36 | 3566 | 3520 | 3474 | 3428 |  |  |  |  | 3198 | 32：3 | 15.7814 |  |  |  |  | 8284 |  |  |  |  | 36 |
| 37 38 38 | ${ }_{1542}^{2554}$ | 1493 |  |  |  |  |  | 1202 | 11 |  |  | 62 | ${ }_{578}^{239}$ | ${ }_{6879}^{2487}$ | 2584 |  |  |  |  |  | 7 |
|  | 053 |  |  |  | 03 |  |  |  | 0131 |  |  |  |  |  |  | 147 | $111$ | 167 |  |  | 38 |
| 40 | 95 | 4467 | 9416 | 9364 | 9313 | 9262 | 921 | 9160 |  | $35 \cdot 9057$ | $17 \cdot 5348$ | 5453 | 5558 | 5662 | 5767 | 587 | 597 | 608 | 1618 | 62 |  |
| 41 | 8506 |  | 84 | 83 | 8296 | ${ }^{8244}$ | 8191 | 8139 | 8086 | 36．80 | 17.9732 | 9839 | 9947 | P05 |  | 0268 | 03 |  |  |  |  |
| 42 | 7493 | 744 | 73 | 73 | 7279 | 7225 |  |  |  | 3770 | 18.41 | 4226 | 4335 | 4 |  |  | 177 |  |  |  |  |
| 43 | 648 | 64 | 63 | 63 | 62 | 5 | 6152 |  | 6042 | 38.59 | 18.85 | 8612 | 872 | 883 | 894 | 90 | 9174 |  |  |  | 4 |
|  | 5469 |  | 53 | 53 | 52 | 5188 | 5132 | 50 | 5019 | 39.49 | 19.2 |  | 311 | 322 | 334 | 34 | 3573 |  |  |  | 44 |
| 45 | 445 |  | 43 | 42 | 42 | 4170 | 41 | 4055 | 3997 | 40 | 19.72 | 7385 | 7502 |  | 773 | 78 | 7973 |  |  |  |  |
|  | 344 | 338 | 33 | 22 |  |  |  |  | 2975 | 41.29 | 20．16 |  |  |  |  |  |  |  |  |  |  |
| 47 | 243 | 2373 | 23 | 2253 | 21 | 2133 |  |  | 1953 | $42 \cdot 18$ |  | 6157 | 628 | 640 |  | 66 |  |  |  |  | 47 |
| 48 | 142 | －3 | 12 | ${ }^{1237}$ | 1176 |  |  |  | 09 |  |  | 0546 | 0669 | 07 |  | 104 | 117 | 1296 | 1422 |  | 48 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 49 |
| $\frac{50}{51}$ |  |  |  |  |  |  |  |  | 888 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 737 | 730 | 72 | 7174 | 71 |  | 69 | 69 | 6841 | 46．677 |  |  | 82 |  |  |  |  |  |  |  |  |
| 53 | 636 | 6293 | 62 | 6158 | 6090 | 6022 | 5955 | 5887 | 5819 | 47.575 | 23.2337 | 2475 | 261 |  |  |  |  |  |  |  |  |
| 54 | 534 | 52 | 52 | 51 | S0 | 5004 | 4935 | 4866 | 4797 | 48.4727 | $23 \cdot 67$ | 6862 | 700 | 714 | 728 | 742 | 75 |  |  |  | 54 |
| 55 | 4337 | 4267 | 41 | 412 | 4056 | 3986 | 3915 | 3845 | 3774 | 49.3704 | 24－1104 | 1248 | 1392 | 153 | 1679 | 18 | 196 | 2110 | 2254 |  |  |
| 56 | 332 | 3253 | 31 | 311 | 303 | 29 | 289 | ${ }^{2824}$ | ${ }^{2752}$ | 50．268 | 24．5488 | 563 | 1578 | 59 | 60 | 62 |  | 6512 |  |  |  |
| 57 | 23 | 22 | 21 | 2094 |  | 19 |  | 18 | 1730 | 51.76 | 24：987 | －21 | 0170 | 031 | 04 | 06 |  |  |  |  | 57 |
|  |  | 12 | 1153 | 10 | 10 |  |  |  | 070 | 52 |  | 4407 | 45 | 471 |  | 50 |  |  | 5468 |  | 58 |
| 60 | 0288 | 0213 | 013 | ＋063 |  |  |  |  |  |  |  |  |  | 910 |  |  |  | 9718 |  |  | 59 |
| 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 50 |
|  | 7252 | 7173 | 70 | 70 | 69 | 6856 | 677 | 6698 | 6618 |  |  | 1952 | 2114 | 2276 | 2438 | 260 | 2762 | 29 |  |  | 62 |
| 63 | 624 | 61 | 60 | 59 | 59 | 5838 | 5757 | 5677 | 5596 | 56.55 | $2{ }^{27 \cdot 6}$ | 6339 | 6503 | 66 | 6832 |  |  | 7326 |  |  | 63 |
| 64 | 5228 |  |  | 49 | 4901 | 4820 | 4738 | 4656 | 4574 | 5.49 |  | －111 | 528 |  |  | 1394 |  |  |  |  | 64 |
| 65 | 4216 | 4133 | 4050 | 39 | 38 | 380 | 3718 | 3635 | 3551 | 58．3468 | 28．4941 | 5111 | 5281 | 5451 | 5621 | 5791 | 596 | 6130 | 630 |  | 65 |
| 66 | 3204 <br> 2192 | 3120 2107 | ${ }^{3036}$ | 2951 | 1857 | ${ }_{176}^{278}$ | ${ }_{1678}^{2698}$ | ${ }^{2614}$ | 1529 | 59．2445 | $2{ }^{28.932}$ | 9498 | 9670 | 984 | ＋015 | 018 | 03 |  |  |  |  |
|  | 219 | 1 | 20 | 19 | 1850 | 1764 |  | － | 1507 | 60.14 | $29 \cdot 3$ | 3884 | 4059 | 423 | 44 | 45 |  |  |  |  |  |
| 68 | 118 | 10 |  |  | 0833 | 0746 |  | 05 | 0485 | 61.033 | $29 \cdot 80$ | 8270 | 8448 | 86 | 88 |  |  |  | 951 |  | 68 |
| 70 |  | －080 |  |  |  | 9727 |  |  |  |  |  | 2656 |  | 30 |  |  |  |  |  |  | 69 |
| 70 | 9156 | 9067 | 897 | 888 | 8798 | 8709 | 19 |  | 8440 | 62.8350 | 30 |  | 22 |  | 75 |  |  |  | 8323 |  |  |
|  | 8144 |  |  |  |  | 7690 |  |  | 7418 | 63.7327 | 31 |  |  |  | 1986 | 217 |  |  |  |  | 1 |
|  | ， |  |  | $6856$ |  |  |  |  | 63 | 64.6303 |  | 5815 | 6004 | 619 |  |  |  |  | 713 |  | 2 |
|  | 512 | 6027 5013 | 59 | $\left.\right\|_{68} ^{58}$ | 574 | ${ }_{463}^{565}$ | 45 | 54 | ${ }_{435}^{5373}$ | 65．52 | 32 | 0202 | 0393 | 05 | 0774 |  | 1156 | 1346 | 153 | 1728 | 3 |
| 75 | 4096 |  |  | ${ }_{388}^{482}$ | 371 | 3617 | 35 | 34 | ${ }_{3329}^{4351}$ | 66．4256 |  | ${ }_{8974}^{4588}$ | 1781 | 9366 |  | 9758 |  | ${ }_{1}^{5748}$ |  |  | 74 |
| 76 | 308 | 29 | 2890 |  |  |  | 25 | 240 | 2306 | 68.22 | 33．31 | 3361 | 3559 | 3758 | 2957 | 415 | 4354 | 455 | 4 |  | ${ }^{6}$ |
| 77 | 207 | 197 | 18 | 1777 | 16 | 1580 | 141 |  | 1284 | 69．1185 |  | 774 | 7948 | 815 | 8351 | 85 | 8753 | 8954 |  |  |  |
| 78 | 105 | 0960 | 0860 | 0761 | 0661 | 0561 | 0462 | 0362 | 0262 | 70.016 | 34．192 | 2133 | 233 | 254 | 274 | 294 | 31 | 3356 |  |  |  |
| 79 | 047 |  |  |  |  | 9543 | 442 | 9341 | 923 | 70.9138 | 34．631 | 6520 | 672 | 693 | 713 | 734 | 552 | 7758 | 796 |  | 79 |
| 80 | 9035 | 8933 | 8831 | 8729 | 8627 | 8524 | 8422 | 8320 | 8217 | 71.8115 | 35.069 | 0906 | 1115 | 132 | 1533 | 1742 | 1951 | 2160 | 2369 |  | 80 |
| 81 | 802 | 7920 | 781 |  | 76 | 7506 | 7402 | 72 | 7195 |  | 3550 | 5292 | 550 |  |  |  |  |  |  |  |  |
|  | 701 | 69 | 680 | 66 | 659 | 64 | 6383 | 627 | 6173 | 73.606 | 35．946 | 9679 | 9893 | ＋10 | 0322 | 05 | 0750 |  | 1178 |  | 82 |
| 83 | 5999 | 58 | 57 | 5681 | 557 | 54 | 53 | 52 | 5150 | 74．50 | 36 | 406 | 4282 | 449 | 4716 | 493 | 5150 |  |  |  |  |
| ${ }_{8}^{85}$ | 49 | 4880 | 47 | 4665 | 45 | 4451 | 3323 | ${ }_{3215}^{4236}$ | 4128 |  | 37 | 283 |  |  |  |  |  |  |  |  | 84 |
| 85 |  |  | 3758 | 3650 |  | 3432 | 323 | 3215 |  | 76＇2997 | 37 | 838 | 3060 | 328 | 3504 | 372 |  |  |  |  | 85 |
| 86 | 2963 | 2853 |  |  |  |  |  |  | ${ }_{1061}^{2083}$ |  |  |  | 744 | 767 | 7898 | 81 | 83 | 85 |  | 902 | 86 |
| 88 | 1951 | 1840 | 07 | 1618 |  | 1395 |  |  |  |  |  | 599 | 1838 | ${ }_{645}^{2065}$ | 668 | 25 |  |  | 3202 |  | 87 |
| 89 | 933 | 98 |  |  |  |  |  |  |  | 7989 | 39.01 | 0383 | 0616 | 0848 | 1081 | 1313 | 1546 | 177 |  |  | 88 |
| 90 | 8915 | 8800 | 8685 | 8570 | 8455 | 8340 | 8225 | 8110 | 7994 | 80.7879 | 39．4534 | 4769 | 5005 | 5240 | 5475 | 5710 | 5945 | 618 | 641 | 66 | 90 |
|  | 7903 | 77 |  | 75 | 7438 | ${ }^{7322}$ | 720 | 7089 | 6972 | 81．685 | 39.89 | 9156 | 9394 | 963 | 9869 | ， | 0345 | 0582 |  |  |  |
| 92 | 689 | 6773 | 6656 | 6538 | 6421 | 6303 | 6185 | 6068 | 5950 | 82．5832 | $40 \cdot 3301$ | 3542 | 3782 | 4023 | 4263 | 450 | 474 | 4984 |  |  |  |
| 93 | 5878 | 576 | 5641 | 5522 | 5404 | 5285 | 5166 | 5047 | 4927 | 83.4808 | $40 \cdot 7685$ | 7928 | 8171 | 841 | 865 | 890 | 9143 |  |  |  | 93 |
| 9 | 486 | 4747 | 4627 |  | 438 | 4266 | ${ }^{4146}$ | 3026 | 23905 | 84.3785 85.2761 | 41．2069 | 231 | 2560 |  | 3052 | 329 | 354 | 37 | 40 |  |  |
|  | 3854 | 3733 | 3612 | 349 |  |  |  |  |  | 85.276 | 41.6453 |  | 6949 | 7198 |  | 7694 | 7942 | 8190 |  |  |  |
|  | 284 | 2720 | 259 | 24 | 2352 | 22 | 2106 | 1984 | 1861 | ${ }^{86.1738}$ | $42^{2083}$ | 1087 | 1338 | 158 | 184 |  | 23 |  |  |  | 96 |
|  | 183 | 707 | 1583 | 145 |  | 12 | 1087 |  | 0838 | 87.0714 | 42．522 | 5474 | 5727 | 598 | 623 | 648 | 67 | 6994 |  |  |  |
| 93 |  | 0693 |  |  |  |  |  |  |  |  | 42.9604 | 9860 | ＋116 | 咗 |  | 088 |  | 1396 | 165 |  |  |
| 100 | 8794 | 8667 | 8539 | 8411 | 8283 | 8156 | 8028 | 900 | 7772 | 89.7643 | $43 \cdot 837$ | ${ }_{863}^{4246}$ | 8894 | 9155 | 9417 | 9678 | 9939 | 200 | ${ }^{60562}$ | 72 |  |
|  | $60^{\prime}$ | 59 | 58 | $57^{\prime}$ | $56^{\prime}$ | 55＇ | $54^{\prime}$ | $13^{\prime}$ | $52^{\prime}$ | 51 | $60^{\prime}$ | 59 | 8 | 67＇ | $56^{\prime}$ | $55^{\prime}$ | $54^{\prime}$ | $53^{\prime}$ |  | $51^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.

|  | Cosine. |  |  |  |  |  |  |  |  |  | in |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | 24 | 25 |  |  |  |  |  |  |  |  | 4 | $25^{\prime}$ |  |  |  |  |  |
|  | 896 | 8961 | 8960 | 8958 | 8957 | 8956 | 8955 | 8953 | 895 | 395 | 436 | 4439 | 4441 | 444 | 4446 | 49 | 4452 | 4454 | 4457 |  |  |
|  |  |  |  |  |  | 7912 |  |  | 790 | 1.790 | 872 | 8877 | 8882 | 8887 | 8893 | 88 | 8903 |  | 8914 |  |  |
|  |  | 6883 |  |  |  |  |  |  |  | $2 \cdot 685$ | 1.3308 | 3316 | ${ }^{3323}$ | 3331 | 3339 | 3347 | 3355 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 2193 |  |  |  | 245 | 258 |  |  |  |  |
|  | $3774{ }^{3}$ |  |  |  |  |  |  |  |  | 5.370 | . 6616 | 6631 | 6647 |  | 6678 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 0661 | 0649 | 9597 | 9584 | - | ${ }^{1}$ | 95 | 953 | 0567 | 8. | 4.4359 | 43 | 4411 | 4437 | 4464 | 4490 | ${ }_{4516}$ | 4542 | 4568 | O134 |  |
| 10 |  | 9610 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 | 8585 | 8571 | 8557 | 8543 | ${ }^{8528}$ | 8514 | 8500 | 8486 | 8471 |  | 87 | 8824 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 7454 | 7639 | 7423 | 10.7 |  | 3262 | 3294 | 3325 | 3356 | 3387 | 3419 |  |  |  |  |
|  |  |  |  |  |  | 6426 | 6409 | 6392 | 6375 | 11.635 | 76 | 77 | 773 | 7769 | 7803 | 7836 | 7870 | 7904 |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 12.530 | - 21 | 213 | 2176 | 2212 |  |  | 232 |  |  |  |  |
| 15 | 4434 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 | 3397 <br> 2359 <br> 1321 <br> 0283 <br> 9246 | $\left\|\begin{array}{l}3376 \\ 2337 \\ 1298 \\ 0259 \\ 9220\end{array}\right\|$ | 33552315175502349194 | $\left[\left.\begin{array}{l}3335 \\ 2235 \\ 1251 \\ 0210 \\ 9168\end{array} \right\rvert\,\right.$ | 33142271128801859142 | 3293229120501119116 | 32722272118201369091 $\|$ | 3252225511580119065 | $\begin{gathered} 3231 \\ 2183 \\ 1835 \\ 087 \\ 9039 \end{gathered}$ | 14.321015.216116.11217.006217.9013 | $\begin{aligned} & 7.0975 \\ & 7.5411 \\ & 7.9847 \\ & 8.4283 \\ & 8.8719 \end{aligned}$ | 1017 <br> 5455 <br> 9854 <br> 4332 <br> 8771 | 1058 <br> 5499 <br> 994 <br> 4382 <br> 8823 | 1100 <br> 5544 <br> 9987 <br> 4431 <br> 8875 | 1142 <br> 5588 <br> 8034 <br> 4481 <br> 8927 | 1183 <br> 5632 <br> 0081 <br> 4530 <br> 8979 | $\begin{aligned} & 1225 \\ & 5677 \\ & 0128 \\ & 4580 \\ & 9031 \end{aligned}$ | $\left\lvert\, \begin{array}{l\|} 12677 \\ 5721 \\ 0175 \\ 4629 \\ 9083 \end{array}\right.$ | 13085765022246799135 | 1350 16 <br> 5809  <br> 0269 17 <br> 0278  <br> 4788  <br> 9188 19 <br> 90  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 820 | 8181 | 8154 |  |  | 8072 |  |  |  |  | $\begin{array}{\|c} 9.3154 \\ 9.7590 \\ 1072026 \\ 10.6462 \\ 11.0898 \end{array}$ | 3209768820856550963 | 3264 <br> 7755 <br> 2146 <br> 6587 <br> 1029 | 3319 <br> 7762 <br> 2206 <br> 6650 <br> 1094 <br>  <br>  <br>  | 3373 <br> 7820 <br> 2266 <br> 6712 <br> 1159 | 3428 <br> 7877 <br> 2326 <br> 6775 <br> 1224 | 34837934238668371289 | $\left.\begin{array}{\|l\|} \hline 3538 \\ 7992 \\ 2446 \\ 6900 \\ 1354 \end{array} \right\rvert\,$ | $\left.\begin{aligned} & 35992 \\ & 8049 \\ & 2506 \\ & 6963 \\ & 1419 \end{aligned} \right\rvert\,$ |  |  |
| 222232232329 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 6133 |  |  |  |  |  | 5954 | 5924 |  | 20 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 咗 | 487 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 7791675257346643635 | $\begin{aligned} & 7751 \\ & 6710 \\ & 5670 \\ & 4630 \\ & 3590 \end{aligned}$ | $\begin{aligned} & 7711 \\ & 6669 \\ & 5688 \\ & 4586 \\ & 3544 \\ & 3 \end{aligned}$ | 7671 <br> 6628 <br> 5585 <br> 454 <br> 3499 <br>  <br>  | 7631 <br> 6586 <br> 5542 <br> 4488 <br> 3454 <br>  | $\begin{aligned} & 7590 \\ & 6545 \\ & 5499 \\ & 4554 \\ & 3409 \end{aligned}$ | 75506503545744103363 | $\left\|\begin{array}{l\|} 7510 \\ 6462 \\ 5414 \\ 4366 \\ 3318 \end{array}\right\|$ |  |  |  |  |  | 78372833673017665622 |  |  |  |  |  |  |
|  | 7831 <br> 6793 <br> 575 <br> 478 <br> 3680 |  |  |  |  |  |  |  |  |  |  | $\begin{aligned} & 7595 \\ & 2033 \\ & 672 \\ & 0910 \\ & 5349 \end{aligned}$ | $\begin{aligned} & 7675 \\ & 2176 \\ & 6558 \\ & 0999 \\ & 5440 \end{aligned}$ | $\begin{aligned} & 7756 \\ & 200 \\ & 6644 \\ & 1047 \\ & 10331 \end{aligned}$ |  | 7918 <br> 2367 <br> 686 <br> 1265 <br> 5713 | 7998 <br> 2650 <br> 6902 <br> 1353 <br> 5805 | 6988 <br> 1442 <br> 5896 | 2617 <br> 1530 | 8241 <br> 2770 <br> 7159 <br> 1619 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 | 2642160505679592849187 | 2596 <br> 1557 <br> 0518 <br> 9479 <br> 8440 | 2549 <br> 1509 <br> 0469 <br> 9428 <br> 8388 | 2503146104209388336 | 2456 <br> 143 <br> 0370 <br> 9328 <br> 928 <br> 8 |  | 2363138027292278181 | 2316 <br> 1270 <br> 0223 <br> 9776 <br> 8129 | 22701222017491268078 | $\begin{aligned} & \left.\begin{array}{l} 32.2233 \\ 33 \cdot 1774 \\ 344.024 \\ 34 \cdot 0975 \\ 35 \cdot 8026 \end{array} \right\rvert\, \end{aligned}$ | 15.969316.412916.856517.30017.7437 | 97874266866431037541 | 9881 <br> 4322 <br> 8763 <br> 3204 <br> 7646 <br>  | $\begin{aligned} & 9975 \\ & \hline 8496 \\ & 8862 \\ & 306 \\ & 7750 \end{aligned}$ | $\begin{aligned} & 8069 \\ & \hline 859 \\ & 8596 \\ & 3488 \\ & 7854 \end{aligned}$ | $\begin{aligned} & 0162 \\ & 4611 \\ & 9060 \\ & 3509 \\ & 7958 \end{aligned}$ | 0256478891593618062 | $\begin{aligned} & 0350 \\ & 4804 \\ & 9258 \\ & 3713 \\ & 8167 \end{aligned}$ | $\left.\begin{array}{\|} 0444 \\ 4901 \\ 9957 \\ 3874 \\ 3271 \end{array} \right\rvert\,$ | 0538 <br> 4997 <br> 9956 <br> 3966 <br> 8375 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | $\left\|\begin{array}{l} 7401 \\ 6362 \\ 5323 \\ 4284 \\ 3245 \end{array}\right\|$ | 7348 <br> 6308 <br> 5227 <br> 4227 <br> 3187 |  | $\begin{aligned} & 2424 \\ & 5199 \\ & 595 \\ & 5456 \\ & 4113 \\ & 3070 \end{aligned}$ | $\begin{aligned} & 7189 \\ & 6145 \\ & 5100 \\ & 4056 \\ & 3012 \end{aligned}$ | 7136600504539992954$\mid$ | 7083 <br> 6036 <br> 4989 <br> 3924 <br> 2896 | 7029 <br> 5981 <br> 4933 <br> 3885 <br> 2837 |  | 18.187318.63019.074519.518119.9617 | $\begin{aligned} & 1988 \\ & \hline 6818 \\ & \hline 885 \\ & \hline 5295 \\ & 9734 \end{aligned}$ | $\begin{aligned} & 20878 \\ & 6598 \\ & 6969 \\ & 5490 \\ & 9850 \end{aligned}$ | 2194 <br> 6637 <br> 1081 <br> 5525 <br> 9969 <br>  | 23006747119356391086 | $\begin{aligned} & 2407 \\ & 686 \\ & \hline 85 \\ & 5754 \\ & 5754 \\ & 020 \end{aligned}$ | $\begin{aligned} & \begin{array}{l} 514 \\ 6966 \\ 1467 \\ 5817 \\ 5896 \\ \\ \hline 320 \end{array} \end{aligned}$ | 2621 <br> 7075 <br> 1529 <br> 5983 <br> 0438 | $\begin{aligned} & \mathbf{l} 7728 \\ & 784 \\ & 1761 \\ & 1648 \\ & 8098 \\ & 0555 \end{aligned}$ | 2834 <br> 7294 <br> 1753 <br> 6213 <br> 0672 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 2087 <br> 1045 <br> +004 <br> 8962 <br> 7921 | 2027 <br> 0985 <br> 9942 <br> 8899 <br> 7856 | 1968 <br> 0924 <br> 9880 <br> 8835 <br> 7794 | 1908  <br> 0863  <br> 9817  <br> 8772  <br> 87726  <br> 7  <br> 863  | 1849 <br> 0802 <br> 9755 <br> 8708 <br> 7662 | 1789 <br> 0741 <br> 9693 <br> 8645 <br> 7597 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 12 |  | 6 2146 <br> 7 1106 <br> 8 0066 <br> 9 9025 <br> 0 7985 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | $42 \cdot 96$ |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | 8114 | 8050 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 4933 |  | 4796 | 4727 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 | 2926 | 2855 | 2784 | 2713 |  |  |  |  |  | 49.22 | $24 \cdot 39$ | 1119 |  |  |  | 4693 | 4836 |  |  |  |  |
|  | 1888 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8342 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 | 773 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 46 | 45 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 21 | 23 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 515 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0512 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | $67 \cdot 12$ |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 812 |  |  |  |  |  |
|  | 1096 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 8352 |  |  |  |  |  |  |  |  |  |  |  |  | 8 |
|  |  |  | 5776 |  |  |  |  |  |  | 71.60 |  |  |  |  |  |  | 125 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4907 | 4802 |  |  |  |  |  |  |  |  |  |  |  | 438 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 37.70 |  |  |  |  |  |  |  |  |  |  |
|  | 1794 |  |  |  |  |  | 1135 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{87}^{86}$ |  |  | 0534 |  |  |  |  |  | ${ }_{88}^{98}$ | $\left\lvert\, \begin{aligned} & \text { 76.9755 } \\ & 77.8706\end{aligned}\right.$ | ${ }^{38.14}$ |  |  |  |  | 705 | ${ }_{7286}^{2834}$ |  |  |  | 6 |
| 87 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 15 | 173 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 90 | 6606 | 6489 | 6373 | 6257 | 6141 | 6024 | 5908 | 5791 | 5674 | 80 | 39.9233 | 1946 | 9703 | 9937 | +172 | 0406 |  | 087 |  |  |  |
| 91 | 5568 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4530 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  | ${ }_{84} 1$ | ${ }_{41}$ |  |  |  |  |  |  |  |  |  |  |
|  |  | 1294 | 1172 | 1049 |  | 080 | 068 | 0557 | 043 | 85.031 | $42 \cdot 1413$ | 166 | 1908 | 215 | 2403 | 26 |  | 14 | 339 |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 42.5849 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 43.02 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 6229 | 6099 |  |  |  |  |  | 532 | 194 |  | 4435 |  | 4, | 437 | 4635 | 489 |  | 541 |  |  |  |
|  |  |  | $38^{\prime}$ | $37^{\prime}$ | $36^{\prime}$ | $35^{\prime}$ | $1^{34}$ |  |  | $31^{\prime}$ |  |  |  |  | 36 | $35^{\prime}$ | 3 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $26^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Stine． |  |  |  |  |  |  |  |  |  | $26^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | 31 | $32^{\prime}$ | $33^{\prime}$ | $34^{\prime}$ | $35^{\prime}$ | 36 | 37＇ | $38^{\prime}$ | 39 | $30^{\prime}$ | $31^{\prime}$ | 32＇ | 33 | $34^{\prime}$ | $35^{\prime}$ | $36^{\prime}$ | $37^{\prime}$ | $38{ }^{\prime}$ |  |  |
|  | 8949 | 8948 | 8947 | 89 | 8944 | 89 | 8942 | 8940 | 8939 | ＇893 | 446 | 4465 | 4467 | 4470 | 4472 | 4475 | 4478 | 4480 | 4483 | 4485 |  |
|  | 7899 | 7896 | 7893 | 78 | 7 | 78 |  |  |  | 787 | 析 | 8929 | 8934 | 8940 |  | 8． | 8955 | 8960 | 66 | 8971 |  |
|  | 6848 | 68 | 68 | 6836 | 6832 | 682 |  | 6821 |  | 681 | 13386 | 3394 | 3402 | 340 | 34 | 342 | 343 | 344 | 3448 | 3456 |  |
|  | 5797 | 5792 | 5787 | 5782 | 5777 | 5771 | 5766 | 5761 | 5756 | ． 575 | －7848 | 7858 | 78 | 7879 |  | 7900 | 7910 | 79 | 7931 |  |  |
| 5 | 437 | 47 | 4734 | 4 | 472 | 14 |  | 01 |  |  | 2.2310 | 223 | 2336 | 2349 |  | 2375 | 2388 | 40 | 2414 | 2427 |  |
| 6 | 3696 | 3688 | 3680 | 3673 | 3665 | 3657 | 3649 | 3641 | 3634 | ＇362 | 2.6772 | 6787 | 6803 | 6819 | 6834 | 6850 | 6866 | 6881 | 6897 |  |  |
|  | 264 | 263 | 262 |  |  |  | 259 | 2582 | 2573 | 6.25 |  | 1252 | 127 |  | 1307 | 13 | 仡 |  |  |  |  |
|  | 1595 | 1584 | 1574 |  | 1553 |  |  |  |  | $7 \cdot 150$ | 3.5696 | 57 | 5737 | 5758 | 5779 | 5800 | 58 | 5842 | 5862 | 5883 |  |
|  | 05 | 053 | 0521 |  | 0497 | 0486 | 0474 |  | 0450 |  |  | 0181 | 0205 | 0228 | 025 | 0275 | 0298 | 3322 |  |  |  |
| 10 | 949 | 9480 | 9467 | 9454 | 9441 | 9428 | 9415 | 9402 | 9389 | 8.9376 | 4620 | 4646 | 4672 | 4698 | 472 | 4750 | 4776 | 4802 | 882 | 4854 |  |
| 11 | 844 | 84 | 84 | 8400 | 8386 | 837 | 8357 | 8343 | 8328 |  | 4．9082 |  |  |  |  |  |  |  |  |  | 1 |
| 12 | 73 |  |  |  |  | 硣 |  | T2 |  | 10.72 |  | 3575 | 360 | 363 | 3669 | 3700 | 37 | 3762 | 3794 |  | 12 |
| 13 | 634 | 6325 | 6308 | 629 | 6274 | 62 | 6240 | 62 | 620 | 11.61 |  | 8040 | 8073 | 810 | 8141 | 8175 | 82 | 8242 | 827 |  | 3 |
| 14 | 529 | 5 | 5254 | 223 | 5218 | 5200 | 5182 | 5163 | 45 | 12 | 2468 | 2504 | 2541 | 257 | 2613 | 2650 | 2686 | 2723 | 2759 | 2795 | 14 |
| 15 | 42 |  |  |  | 4162 | 4143 | 4123 | 4104 | ， 84 | $13 \cdot 4064$ | 6930 | 6969 | 7008 | 70 | 7086 | 712 | 71 | 7203 | 7242 | 7281 | 15 |
| 16 | 31 | 3169 | 3148 | 3127 | 3106 | 3086 | 3065 | 3044 | 3023 | 14．3002 | $\cdot 1392$ | 14 | 147 | 151 | 1558 | 160 | 16 | 1683 | 1725 | 766 | 16 |
| 17 | 213 | 21 | 20 | 2073 |  | 202 | 200 |  | 1962 | $15^{\circ}$ |  | 58 | 24 | 598 | 60 | 60 |  |  |  |  |  |
| 18 | 1088 |  |  |  | 0995 | 097 | 0948 | 0924 | 0901 | $16^{\circ}$ | ． 0316 | 03 | 0409 | 045 | 05 | 0550 | 0597 | 0643 | 0690 | 0737 | 18 |
| 19 | 0038 | －0 | 9988 | 63 | 9939 |  |  | 986 | 9840 | 16. | 4778 | 48 | 487 | 49 | 4975 | 50 | 50 | 5124 | 5173 |  |  |
| 20 | 89 | 8961 | 8935 | 8909 | 8883 | 8857 | 8831 | 8805 | 779 | $17 \cdot 875$ | 8.9240 | 929 | 93 | 93 | 94 | 5500 | 9552 | 9604 | 9656 | 9708 | 0 |
| 21 | 79 |  |  | 7854 |  |  |  |  |  | 18.769 | $0 \cdot 3702$ | 3756 | 381 | 3866 | 3920 | 3975 | 4029 | 4084 |  |  | 21 |
| 22 | 688 | 68 | 682 | 6800 | 677 |  |  |  |  |  | 981 | 8221 | 82 | 8335 | 83 | 84 |  |  | 8621 |  | 22 |
| 23 | 5835 | 58 | 5775 | 545 | 5715 | 5685 | 565 | 5626 |  | 20 | 10.2625 | 2685 | 2745 |  | 2865 | 29 |  |  | 310 |  | 23 |
| 24 | 478 | 47 | 47 |  |  |  |  | 4566 | 4534 | 21.45 | $10 \cdot 70$ |  | 7212 | 727 | 733 | 740 | 746 | 7525 | 7587 |  | 24 |
| 25 | 373 | 3701 | 66 | 36 | 3604 | 3571 | 35 | 3506 | 3473 | 22．34 | $11 \cdot 15$ | 1615 | 1680 | 1745 | 181 | 187 | 194 | 2005 | 207 | 13 | 25 |
| 26 | 268 | 26 | 2615 | 2582 | 2548 | 2514 | 2480 | 2446 | 2412 | 23 | 11 | 6079 | 6147 | 6214 | 6282 | 6350 | 6417 | 6485 | 6553 | 6620 | 26 |
| 27 | 163 |  | 1562 | 1527 |  |  |  |  |  |  | 12.04 |  | 0614 |  |  |  |  |  | 1035 |  |  |
| 28 | 05 | 05 | 05 | 0472 | 0436 | 040 | 036 |  | 029 |  | 12.4 |  | 50 | 515 |  | 537 | 537 | 5445 | 5518 | 559 | 28 |
| 29 | 95 | 94 | 94 | 9418 |  | 934 |  |  |  |  | 12.93 |  | 9548 | 9624 |  |  |  |  | 100 |  |  |
| 30 | 8480 | 8441 | 8402 | 8363 | 8324 | 8285 | 824 | 8207 |  | 26.812 | 13.38 |  | 4016 | 4094 | 417 | 4250 | 4328 | 4406 | 4484 | 456 |  |
| 31 | 7430 |  |  |  | 7269 |  |  |  |  | 27.706 | $13 \cdot 832$ |  | 8483 |  |  |  |  |  |  |  | 31 |
| 32 | 637 |  |  | 625 | 62 | 617 | 612 |  | 604 |  |  |  | 295 | 30 |  |  |  |  | 344 |  | 32 |
| 33 | 532 | 5285 | 52 | 5200 | 5157 | 5114 |  |  |  | 29.45 | 14.7245 | 73 | 74 | 7503 |  |  | 7761 |  | 793 | 3018 | 33 |
| 34 | 427 | 4234 | 4189 | 4145 |  |  | 4012 |  |  |  | 15 | 1796 | 18 | 19 |  | 21 | 238 | 2327 | 2415 | 250 | 34 |
| 35 | 3227 | 3182 | 3136 |  | 3045 |  |  |  | 2863 | 31.2817 | 15 | 6260 | 63 | 64 |  | 6625 | 67 | 6807 | 6898 |  | 35 |
| 36 | 21 | 2130 | 2083 | 2036 | 1989 | 1942 | 1896 | 1849 | 1802 | 32．1755 | $16 \cdot 0631$ | 0725 | 0819 | 0912 |  | 1100 | 1193 | 1287 | 1381 |  | 36 |
| 37 | 11 |  |  |  | 0933 |  |  |  | 0741 | 33.069 | 16.5093 |  | 528 |  |  | 5575 | 5671 | 576 |  |  |  |
|  | 007 | ＋026 | 99 | 9927 | 9878 | 9828 | 977 |  | 9680 | 33.963 | 16 |  | 975 | 9852 |  | －050 | 0148 | 024 | 034 | 0445 | 38 |
| 39 | 902 | 8974 | 8 | 8872 |  |  |  |  | 8619 |  | 17：40 |  | 422 |  | 44 | 45 | 462 | 472 | 4829 | 493 |  |
| 40 | 7974 | 7922 | 7870 | 7818 | 7766 | 7714 |  | 7610 | 7557 | $35 \cdot 7505$ | 17－8479 | 8583 | 868 |  | 8896 | 9000 | 910 | 9208 | 312 |  | 40 |
| 41 | 69 |  |  |  |  |  |  |  |  |  |  |  |  | 326 |  |  |  |  |  |  | 41 |
| 42 | 587 |  |  | 5709 | 565 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 482 | 47 | 47 | 4654 | 459 |  |  |  | 4374 | 38．431 | $19 \cdot 1865$ | 1977 |  |  |  | 425 | 2536 |  |  | 87 |  |
| 44 | 377 | 371 | 365 |  | 3542 |  |  |  | 33 |  |  | 644 | 655 |  |  |  | 7014 |  | 724 |  | 44 |
| 45 | 2720 | 2662 | 2604 | 2545 | 2487 | 2428 | 2369 | 2311 | 2252 | 40.21 | 20. | 09 | 10 | 1140 | 12 | 1375 | 1492 | 1609 | 1726 | 1843 | 45 |
| 46 | 16 | 1610 | 1550 | 1491 | 1431 |  |  |  |  | 41.11 |  |  |  |  |  | 5850 | 5969 |  |  |  | 46 |
| 47 | 06 | 0558 |  | 0436 | 037 |  |  |  | 0130 | 42 | 20 | 9835 |  | ＋0 |  | 032 | 044 |  |  |  |  |
| 48 | 95 |  |  |  |  |  |  |  |  | 42 | 21 |  | 44 |  |  | 480 | 492 |  |  |  |  |
| 49 | 85 |  | 8391 | 8327 | 8263 |  |  | 8072 | 8008 | $43 \cdot 79$ | 1 | 87 | 88 | 90 | 91 | 27 | 9402 | 952 |  |  |  |
| 50 | 746 | 7402 | 7337 | 7272 |  | 7142 | 7077 | 7012 | 6947 | 44.6882 | 2 | 322 | 335 | 3489 | 361 | 375 | 3880 | 4010 | 4140 | 427 | 50 |
| 51 | 64 | 635 |  | 6218 |  |  |  |  | 588 |  |  |  |  |  | 80 | 822 |  |  |  |  |  |
| 52 | 53 | 5298 | 5231 | 5163 | 50 |  |  |  |  | 46 |  |  | 22 |  |  |  |  |  |  |  | 52 |
| 53 | 4315 | 42 | 4178 | 4109 | 404 | 397 | 3902 | 3833 | 376 | 47 | 23 | 6623 | 676 |  |  | 7174 | 7312 | 7450 |  |  |  |
| 54 | 326 |  |  |  |  |  |  | 27 |  |  |  |  | 12 |  |  |  |  |  |  |  |  |
| 55 | 22 | 21 | 2071 |  |  | 1856 |  | 17 |  | 19. | 24 | 5552 | 5695 |  |  | 6124 | 6268 |  | 6554 | 6697 | 55 |
| 56 | 1163 | 1091 | 1018 |  | 0872 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 56 |
|  | 01 | －0 | 9965 |  | 981 | 97 |  |  | 95 | 50.9 | 25 | 448 |  |  |  |  | 522 |  |  |  |  |
| 58 | 90 |  |  | 883 |  | 868 |  |  |  | 51 |  |  |  |  |  | 954 |  | 985 | －002 |  | 58 |
| 59 | 801 | 7935 | 7858 |  |  | 7628 |  |  |  | 73 | $26 \cdot 3$ |  |  |  |  | 402 | 417 | 硣 | 44 | 463 |  |
| 60 | 696 | 688 | 6805 | 6727 | 664 | 657 | 6493 | 6414 | 6336 | 53.62 | $26 \cdot 7$ |  | 80 | 818 | 834 | － |  | 8812 | 896 | 9124 | 60 |
| 61 | 研 | 58 |  |  |  | 55 |  | 5355 | 5275 |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 |  |  |  | 618 |  |  |  |  | 4214 | ． 4 |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 380 | 372 | 36 | 3563 | 34 | 33 | 3317 | 32 | 3153 | －3071 | 28 | 126 | 143 | 15 | 17 | 19 | 208 | 22 | 24 | 25 | 63 |
| 64 | 27 |  |  |  |  |  |  | 175 | 209 | $57 \cdot 20$ |  | 573 |  |  | 6 | 63 |  |  |  |  |  |
| 65 | 17 |  |  |  |  |  |  |  |  | －09 | 29 | 019 |  |  |  |  |  |  |  |  | 65 |
|  | 06 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
| 67 | 960 | 95 | 9432 | 934 | 925 | 91 |  | 8996 | 8909 | 59.88 | 29.89 | 91 |  |  | 9650 | 9 |  |  |  | 052 |  |
| 68 |  |  |  |  |  |  |  |  |  | $60^{\circ} 7$ |  | 30 |  |  |  | 4299 | 4476 |  |  |  | 68 |
|  | 750 | 7415 | 7325 | 723 | 71 |  | 69 | 6877 | 6787 | 61.66 | $30 \cdot 78$ | 805 | 823 | 84 | 85 | 8774 | 895 | 91 | 93 | 949 | 69 |
| 70 | 645 | 6363 | 6272 | 618 | 60 | 59 | 5908 | 5817 | 5726 | $62 \cdot 5634$ | $31 \cdot 2338$ | 252 | 27 | 2885 | 306 | 324 | 3431 | 3613 | 3795 | 39 | 70 |
| 71 |  |  | 5 | 51 |  |  |  |  | 析 | \％ 45 | 31.688 |  |  |  |  |  |  |  |  |  |  |
| 72 | 433 |  | 4312 |  |  |  |  |  |  |  |  | 砛 | 637 | 20 | 硡 |  |  |  |  |  |  |
| 73 | 330 | 32 | 31 | 301 | 292 | 28 | 2733 | 2638 | 2542 | 65.24 | 32.57 | 591 | 6104 | 629 | 6484 | 667 | 686 | 70 | 72 | 743 | 73 |
| 74 | 2251 |  |  |  |  |  |  | 1578 | 1481 | 66.13 | 33.01 | 037 | 057 | 076 | 9957 | H2 | 1342 | 153 |  |  | 74 |
| 75 | 1201 | 1103 | 1006 | 0908 | 081 | 0713 |  | 0518 |  | ． 03 | $33^{\circ} 4$ | 484 |  | 523 | 542 | 562 | 58 |  |  |  | 75 |
| 76 | 0150 | ＋051 | 9953 | 9854 | 9755 | 9656 | 57 | 458 |  |  |  |  |  | 9704 | 9901 | ＋09 | 029 |  | 0692 |  | 76 |
| 77 | 90 | 8999 | 8899 | 87 | 869 | 8599 | 8499 | 8398 | 8298 | 68.819 | $34 \cdot 357$ | 377 | 397 | 41 | 4374 | 457 | 47 | 497 |  |  |  |
| 78 | 80 |  |  |  |  |  |  |  | 723 |  |  | 272 | 24 |  | 析 | （ | 253 |  |  |  |  |
| 79 | 69 | 6896 | 67 | 669 | 65 | 6485 | 382 | 6279 | 6176 | 70．607 | 35.2496 | 270 | 2908 | 31 | 3319 | 3524 | 373 | 393 | 414 | 434 | 79 |
| 80 | 5948 | 5844 | 5740 | 563 | 5532 | 5428 | 5323 | 5219 | 5115 | 71.5011 | 35.6958 | 71 | 73 | 75 | 7791 | 799 | 8207 | 8415 | 862 | 883 | 80 |
| 81 | 489 | 3740 | 633 | 35 |  |  |  |  | 4054 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3846 | 3740 | 3633 | 3527 | 3420 | 3313 |  |  | 2993 | $73 \cdot 28$ |  | 609 | 630 | 6522 | 6736 | 974 | 7162 | 737 |  |  | 82 |
|  | 27 | 2688 | 2580 | 2472 | 2364 | 2256 | 2148 | 40 | 1932 | 74．182 | 37.034 | 056 | 0776 | 099 | 1208 | 142 | 164 | 18 | 207 | 228 |  |
|  | 1745 | 1636 | 1527 | 1417 | 13082 | ， |  | 析 | 081 |  |  | 502 | 524 | 546 | 568 | 589 | 610 | 633 | 5 |  |  |
| 85 | 069 | 0584 | 047 | 036 | 025 | 0142 | －031 | 920 | 810 | ． | 37．8 |  | 97 | 993 | 115 | 037 | 059 |  | 103 | 125 | 85 |
|  | 96 | 953 | 942 | 9308 | 9197 | 9085 | 73 | 361 | 8748 | $5 \cdot 86$ | $38^{\prime} 37$ | 395 | 417 | 4402 | 462 | 484 | 5073 | 529 | 55 |  | 86 |
| 87 | 8593 | 8480 | 836 | 254 |  | 8027 | 14 | 7801 | 768 | $77 \cdot 75$ | 38.81 | 84 | 86 | 8871 |  | 932 | 9550 |  |  |  |  |
| 88 | 7542 | 7428 | 731 | 7199 | 7085 | 6970 | 6856 | 6741 | 6626 |  |  | 硅 | 硣 | 3741 | 5370 | 379 | 4028 | 425 | 448 | 47 | 88 |
| 89 | 6492 | 6376 | 6260 |  | 29 | 913 | 5797 | 5681 | 5565 | 79．54 | $39 \cdot 7116$ | 734 | 757 | 781 | 8043 | 827 | 8506 | 873 | 896 | 920 | 89 |
| 90 | 544 | 5324 | 5207 | 5090 | 4973 | 4856 | 4739 | 4622 | 450 | 80.438 | 40．1578 | 1812 | 20 | 228 | 2515 | 274 | 2983 | 3217 |  | 368 | 90 |
| 91 | 4390 | 4272 | 4154 | 4036 | 3917 | 374 | 析 |  |  |  |  |  |  |  |  |  |  | 278 |  |  |  |
| 92 | 334 | 3220 | 3101 | 2981 | 2861 | 2742 | 2622 | 2502 | 2382 | 82.226 | 41.0502 | 0741 | 0981 | 1220 | 1460 | 169 | 1938 | 21 | 24 | 26 | 92 |
| 93 | 2289 | 116 | 0994 | 1926 | 789 | 1684 | 1563 | 1442 | 1321 | $83 \cdot 120$ | 41.4964 | 5206 | 5448 | 5690 | 5932 | 617 | 648 | 665 |  |  | 93 |
| 9. | 123 | 111 | 0994 | 0872 | 07 | 0627 | 0505 | 0383 | 0260 | 84.013 | 41.9426 | 967 | 991 | ＋160 | 0404 | 064 | 085 | 113 | 138 | 627 | 92 |
| 95 | 018 | ．064 |  | 9817 | 9694 | 9570 | 9446 | ， | 9199 | 84．907 | 42.3888 | 4135 | 438 | 463 | 487 | 512 | 537 | 5618 | 5865 | 61 | 95 |
|  | 9137 | 7920 |  |  |  |  |  |  | 8138 | $85 \cdot 8013$ | $42 \cdot 8350$ | 8600 |  |  |  | 9599 |  | ＋098 | 0348 |  | 96 |
|  | 808 | 796 | 783 | 770 | 582 | 7456 | 733 | 720 | 寿 | 86.6950 | 43.2812 | 306 | 3317 |  | 3822 | 4074 | 4326 | 455 | 483 | 5083 | 97 |
|  | 703 | 6908 | 6781 | 6654 | 26 | 639 | 6271 | 6144 | 6016 | 87•5888 | 43.7274 | 7529 | 7784 | 803 | 82 | 8549 | 8804 | 905 | 9314 |  | 98 |
|  | 5985 |  |  |  | 5415 | 538 | 213 | 5084 | 4955 | 88.482 |  | 1994 | 2251 | 2509 | 2766 | 3024 | 3282 | 3539 | 3796 | 5 | 0 |
| 100 | 4934 | 4805 | 4675 | 4545 | 4415 | 4284 | 4154 | 4024 | 3894 | 89．3763 | 44.6198 | 6458 | 6718 | 6979 | 7239 | 7499 | 7759 | 8019 | 8279 | 8539 | 100 |
|  | $30^{\prime}$ | $29^{\prime}$ | 28 | $27^{\prime}$ | $26^{\prime}$ | $25^{\prime}$ | 24 | $23^{\prime}$ | $22^{\prime}$ | 21 | $30^{\prime}$ | 29 |  | $27^{\prime}$ | 26 | $25^{\prime}$ | $24^{\prime}$ | ， | 22 | $21^{1}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.

| $27^{\circ}$ |  |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{2}^{1}$ |  | ${ }_{7815}^{8907}$ |  | ${ }_{7810}^{8905}$ | 8903 |  |  |  |  |  | ${ }^{45458}$ | ${ }^{4545}$ | ${ }^{45488}$ |  |  |  |  |  |  |  |
|  |  | live 6 | ${ }_{6}^{6622} 5$ |  |  |  |  |  |  | 2.55 | 1.3620 | ${ }^{627}$ |  | 3093 |  |  |  |  |  |  |  |
|  |  |  | ${ }_{4537}^{5630}$ | 5624 |  |  |  | 03 |  | 3.5953 <br> 4.449 | 18180 |  |  | ${ }^{81798}$ |  | 54 |  |  |  |  |  |
|  | ${ }_{5}^{6} 5$ | ${ }^{3352}$ | ${ }^{3454}$ | ${ }^{3337}$ | ${ }^{3323}$ |  |  |  | 37 |  | $\xrightarrow[\substack{2 \cdot 7239 \\ 3 \cdot 179}]{\substack{\text { a }}}$ |  |  |  |  | 1317 |  |  |  |  |  |
|  |  | ${ }^{2270}$ | 125 | 23 |  |  | 17 | 206 | 1196 |  | 3:3319 | 340 | 361 | $\begin{aligned} & 1834 \\ & 6381 \\ & 634 \end{aligned}$ | $\begin{aligned} & 1850 \\ & 6040 \\ & 0.020 \end{aligned}$ | 6423 | 6444 | 6464 | 6485 |  |  |
| 10 | \% 1091 | ${ }_{9087}^{0179}$ | 1016 | 0.065 |  |  |  |  | ${ }^{0095}$ |  | 4.0959 |  |  | ${ }_{547}^{0929}$ | 2052 | 5296 |  |  |  |  |  |
|  | 188011 | ${ }^{7996}$ | ${ }^{7882}$ | ${ }^{7987}$ |  |  |  |  |  |  |  |  |  | .0224 | ${ }^{0} 53$ |  |  |  |  |  |  |
| 12 | ${ }^{6923} 5$ | ${ }_{5814}^{6905}$ | 68889 | 6873 <br> 577 | 6857 |  | ${ }^{26}$ | 6810 5710 | ${ }_{5683}^{6794}$ |  | 4,79 | 510 |  |  | 503 |  | 4 |  | ${ }^{47288}$ |  |  |
|  |  |  | 4704 |  |  |  |  | 4611 | 4593 |  | 6.3559 |  |  |  |  | 374 |  |  | 928 |  |  |
|  | 3651 | 3631 | 3611 |  |  |  |  |  | 3492 |  | 6.809 | 137 | 18176 |  |  |  | ${ }_{832}$ |  |  |  |  |
|  | ${ }^{656}$ | 2540 | 2519 | 2498 | ${ }^{2476}$ | 2455 | 2434 | 2413 | 239 | 14.237 | 7.2638 |  |  |  |  | 284 |  |  |  |  |  |
| 18 | 180381 | ${ }_{\text {235 }}^{148}$ | ${ }_{\text {l }}^{14364}$ | ${ }_{0310}^{1404}$ | 028 | 0262 | 38 | 14 | ${ }^{1291}$ |  |  | 1222 | 286 | $\left\lvert\, \begin{array}{c\|c\|} \hline 1858 \\ \hline 181 \end{array}\right.$ | 205 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 9990 |  | 8•6258 |  | 6357 | 6406 | 6455 | 6504 | 655 | 650 | 665 |  |  |
|  |  |  |  |  |  |  |  |  |  | 18.68 | 9.5338 |  |  |  |  |  |  |  |  |  |  |
|  | 6021 | 5992 | 5963 | 5934 |  | 5876 | ${ }_{5847} 5$ | 5818 |  |  |  |  | 92 | *049 |  |  | ${ }^{\text {O2020 }}$ |  | ${ }^{5173}$ |  |  |
| 23 | ${ }^{49362}$ | ${ }_{381}^{4901}$ | 487 |  | 4810 | 479 |  | 3619 |  | 657 | 10.4418 | 447 | 4538 | 4597 | 4656 | 471 | 4773 | 483 | 4898 |  |  |
|  |  | 3719 | 268 |  | 2719 | 3683 |  |  | ${ }_{248}^{3287}$ | ${ }_{22}^{272454}$ |  | 356 | 3082 | 3194 | 3206 |  |  | ${ }_{395}^{939}$ | $\xrightarrow{9455}$ |  |  |
| 27 | 1662 | ${ }^{1627} 1$ | ${ }^{1593} 10$ |  | ${ }^{1524}$ | $\left.\right\|^{14390} 0$ | 1455 | ${ }^{1422}$ | ${ }^{13866}$ | ${ }^{231352}$ | 1 1.8388 | 8105 | 8172 | ${ }^{8260}$ | ${ }^{3857}$ | ${ }^{8374}$ | 8842 | ${ }^{8509}$ |  |  |  |
|  | 9482 | 9445 | 9408 | 9371 | 9334 | 9297 | 9260 | ${ }_{922}$ | 9185 | 24. | 12.7117 | 7190 | 726 | 7335 | 408 | ${ }_{748}^{222}$ | ${ }_{755}^{293}$ | ${ }_{762}$ | 71988 |  |  |
|  | 7302 | 835 | ${ }_{7223}^{8315}$ | ${ }_{7183}^{827}$ | ${ }_{1143}^{8239}$ | ${ }^{8200}$ | ${ }_{7}^{8162}$ | ${ }_{8}^{8123}$ | 8085 |  | 3'6 | 1732 | 1808 | 1883 | 1958 | ${ }^{203}$ |  | 674 |  |  |  |
|  | ${ }^{6212}$ | 6179 | ${ }^{6130}$ | 6889 | 6048 | 6007 | 5966 | 硅 | 5884 | 843 | .0737 | ${ }^{817}$ | 898 | 0978 | O58 | 1139 | 1219 | 1299 |  |  |  |
| 32 <br> 33 |  |  | 5038 |  |  |  | 4868 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 29 |  | 285 | 2887 |  |  |  |  | 2582 | $30^{\circ} 2337$ |  | 444 | ${ }_{453}^{483}$ | 462 |  | ${ }_{4797}$ | ${ }_{4885}^{4335}$ | 4973 |  |  |  |
|  |  |  |  |  |  |  |  |  |  | ${ }^{311} 1435$ | 887 |  | 9078 | 216 |  |  |  |  |  |  |  |
|  | 0762 | 071 | ${ }^{0667}$ | -620 | O572 | ${ }^{0524}$ | 0.47 | 0429 | $\begin{aligned} & 0981 \\ & 92818 \end{aligned}$ | :0333 | ${ }^{16 \cdot 3 / 337}$ | 3530 | ${ }^{3623}$ | 3716 | 3810 | 3903 | 399 | 4089 | 4 |  |  |
| 38 | ${ }^{8582}$ | 853 |  | 8432 | 8382 | ${ }_{8331}^{431}$ | ${ }_{8281}^{371}$ | ${ }_{823} 8$ | ${ }_{8180}^{281}$ | 30 | 17.2516 | 215 | 2713 | 2812 |  |  |  | 3205 | ${ }_{330}$ |  |  |
|  |  | ${ }_{635}^{743}$ |  |  | ${ }^{279}$ | ${ }_{1}^{2} 183$ | ${ }^{1783}$ | ${ }^{763}$ | 7980 | 26 | liplite | 1757 | ${ }^{204}$ | 1335 | 2011 | 26 | 763 |  |  |  |  |
|  | 5313 | 5259 |  | 5150 | 5096 |  | 49 |  |  |  | ${ }^{8 \cdot 6136}$ |  | 539 | 6455 | 561 | ${ }^{6667}$ | 6773 | 6880 |  |  |  |
| 43 | 323 | 4167 | ${ }^{412}$ | 2056 | 400 | 384 | ${ }^{3789}$ | 373 |  | 37 |  | ${ }^{7} 82$ | 0894 | 1003 |  |  |  |  |  |  |  |
| 44 |  |  |  |  |  |  |  |  |  |  |  |  | 984 | P098 | 0212 | 32 | 0440 | 055 |  |  |  |
|  |  | 980 |  | 968 | 962 |  | 9498 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | ${ }^{3587}$ | 8525 |  | 8400 | ${ }^{838}$ | 8275 | 418213 |  | 349 | 3619 | 3741 | 363 | 3984 | 4106 | ${ }_{4228}$ | 4349 |  |  |
| ${ }_{4}^{48}$ |  |  |  |  |  |  | 7302 | ${ }^{2339}$ | 7175 | 427111 |  | 8090 | ${ }^{8166}$ | ${ }^{8288}$ | ${ }^{8813}$ | 833 | 866 | 8 |  |  |  |
|  |  | ${ }_{643}^{658}$ | ${ }_{537}^{6464}$ | ${ }_{5305}^{639}$ | ${ }_{5}^{634}$ | ${ }_{5173}^{629}$ | 5108 | 639 | 6074 |  |  |  | 254 | ${ }_{738}^{2836}$ | 3 | 764 |  |  |  |  |  |
|  | ${ }_{3323}^{4413}$ | ${ }_{325}^{43}$ | ${ }_{318}^{427}$ | ${ }_{3117}^{4211}$ | ${ }_{3048}^{4148}$ | ${ }_{2980}^{4976}$ | ${ }_{2911}^{4009}$ | ${ }_{2842}^{394}$ | ${ }^{3873}$ |  |  |  | ${ }_{6}^{1799}$ | 6479 | ${ }_{\substack{2064 \\ 6614}}^{20}$ | 6749 |  | ${ }_{70}^{2460}$ |  |  |  |
| 53 | 2333 | ${ }_{2} 2163$ | 209 | 2023 | 1953 | ${ }^{2983}$ | ${ }_{1813}^{2917}$ | 1783 | 167 |  |  |  | ${ }^{\text {a }} 8.395$ | ${ }_{1027}$ | ${ }^{1} 164$ | ${ }_{132}^{7149}$ | 1439 | 1 | ${ }_{1713}^{173}$ |  |  |
|  |  |  |  |  |  |  | 0715 |  | 057 |  |  | $\begin{aligned} & 5295 \\ & \hline 9827 \end{aligned}$ | $\begin{aligned} & 5435 \\ & 9980 \\ & 990 \end{aligned}$ | $\begin{aligned} & 5575 \\ & \mathbf{5} 122 \end{aligned}$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 9590 | 18519 |  |  |  |  |  |  | $0122 \mid$ |  |  | 0.55 |  |  |  |  |
|  | 1874 | 7798 | ${ }_{773}{ }^{871}$ | ${ }_{7648}^{8742}$ | ${ }^{8572}$ | 7 | ${ }_{7421}^{87}$ | ${ }_{7346}^{8445}$ | ${ }_{727}^{887}$ |  |  | 3922 | 4070 | ${ }_{9218}^{4671}$ | ${ }_{9365}^{4815}$ | ${ }^{4961}$ | ${ }^{5105}$ | ${ }_{988}^{5250}$ | 5 |  |  |
| 58 | 67884 | 6707 | 6631 | ${ }^{6554}$ | 6477 | 6400 | ${ }^{6323}$ | ${ }^{6247}$ | 6170 |  |  | 3465 | 3615 | 376 | 3916 | 4066 | 4216 | 4366 | 451 |  |  |
|  |  |  |  |  | 4288 | $\left.\right\|_{4204} ^{5304}$ | ${ }_{4} 5228$ | 4048 | 3969 | - 53.3889 | ${ }_{27}^{22} 2$ | 250 | 705 | 2861 | ${ }_{3016} 846$ | 1717 | ${ }_{327}^{87}$ | ${ }_{3482}^{8924}$ | 3638 |  |  |
|  | 3514 | ${ }^{3633}$ | 3353 |  | 319 |  | 30 |  |  | 54.278 | 27 | 7092 | 7250 | 7408 | ${ }^{7566}$ | ${ }^{772}$ | 7882 | 8040 | 819 |  |  |
| 63 | ${ }_{334}$ | ${ }_{1251}^{234}$ | ${ }_{1168}^{2268}$ | 1084 | 1001 | 1218 | 0834 | O751 | ${ }_{067} 7$ | ${ }_{56}^{56.0583}$ |  |  | $\begin{aligned} & 1795 \\ & 6344 \\ & \hline \end{aligned}$ | 650 |  |  |  |  |  |  |  |
| ${ }_{65}^{64}$ |  |  |  |  |  |  |  |  |  |  |  |  |  | 1051 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 780 |  | 7628 |  |  |  |  | 29.9634 | 805 | 997 | +147 | 0318 | 0489 | 0660 | 0831 | 100 |  |  |
| ${ }_{68} 8$ | ${ }_{5884} 59$ | ${ }_{5985}^{688}$ | 5705 | 56, | 5625 | ${ }_{5435}^{6531}$ | ${ }_{6}^{6443}$ | ${ }_{5255}^{6354}$ | ${ }_{5164}^{6255}$ |  | 30:8, | lisi | ${ }^{4521}$ | ${ }_{924}^{4694}$ | 4848 | 9594 | 5771 |  |  |  |  |
|  |  | 4703 | 4612 | 452 | 4430 | 4338 | 4247 | 4155 | 4064 |  |  | 432 |  | 379 |  | 414 | 432 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 152 |  |  | 1239 | 1144 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 43 | 033 |  |  |  |  |  |  |  |  |  | $1602$ |  | 988 |  |  |  |  |  |  |  |
| 74 | 23255 | ${ }_{8156}^{224}$ | ${ }_{8057} 9$ | 7958 | ${ }_{7858}^{8953}$ | ${ }_{7759}^{8856}$ | ${ }_{765}^{8757}$ | ${ }_{750}^{8559}$ | 7661 | S5.88433 66.7361 | 335953 34.0493 | 10687 | 6832 | 1078 | 1270 | 1454 | 165 | 185 |  |  |  |
| 76 | 7165 | 7065 | ${ }^{59864}$ | ${ }^{6864}$ | ${ }^{67683}$ | 66 | ${ }^{6562}$ | ${ }_{6451}^{6461}$ | ${ }^{6360}$ | 67\% 625 | 34.5 | 523 | 5422 | 5624 | 5820 | 6017 | 524 | 641 |  |  | 76 |
|  |  |  |  |  |  |  |  | ${ }_{426} 5$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 3686 | ${ }_{3582}$ |  | 3373 | ${ }_{3268}$ | 3163 | 3059 |  | 35.8652 | 385 | 9062 | 926 | 987 | ${ }^{967}$ | 988 | P885 | 0290 |  |  |
|  |  |  | 2594 | 2488 | 2382 |  |  |  | 1988 | 71.1852 | (1) |  |  |  |  |  | 4436 |  |  |  |  |
|  |  |  |  |  | ${ }^{287}$ |  |  |  | ${ }^{0858}$ |  |  | 94 | 8152 |  | 8 | ${ }^{8782}$ | 8991 | ${ }^{9201}$ |  |  |  |
| 83 | 535 | 9426 | ${ }_{316}$ | 920 | 2096 | ${ }^{8987}$ | ${ }_{8877} 8$ | ${ }^{8767}$ | 86 | ${ }^{73}$ |  | ${ }_{702}^{248}$ | ${ }_{7242}^{29}$ | 745 | 7672 | ${ }^{33} 8$ | ${ }_{8,10}^{351}$ | ${ }_{83}^{3317}$ |  |  |  |
| 84 |  |  |  |  |  |  |  |  |  |  |  |  | $1787$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 38.5892 |  |  |  |  |  |  |  |  |  |  |
|  | 526 |  |  | 592 | 5811 |  |  | ${ }^{53689}$ |  | 76.524 |  | 065 |  |  | ${ }^{1323}$ | 1546 | 1769 | 1981 | 675 |  | 86 |
| 88 |  | 396 | ${ }_{3883}^{4346}$ | 437 | ${ }_{3620}^{441}$ | 46 | ${ }_{3387}^{4385}$ | ${ }_{3271}^{437}$ | ${ }_{3154}^{423}$ |  |  | 9740 | ${ }^{542}$ | 1964 | 0624 | 0.552 | 0880 | 1107 |  |  |  |
| 90 | 1906 | ${ }^{2878}$ |  | ${ }^{2643}$ |  |  | ${ }_{1192}^{2289}$ |  |  |  |  |  | 451 | 478 |  | 520 |  |  |  |  |  |
|  | 81 | 0696 | 057 | 045 | 0335 |  | \%08 |  |  |  |  | ${ }^{33} \mathrm{C}$ |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 87 |  |  |  |  |  |  |  |  |  |  | 578 |  |  |
| 94 | 8564 | ${ }_{7}^{8523}$ | ${ }_{7298}^{8398}$ | ${ }_{8173}^{826}$ | ${ }_{7}^{8154}$ | ${ }_{695}^{8022}$ | 7898 | ${ }_{6}^{6675}$ | ${ }^{7655}$ | ${ }_{83}^{88.645}$ |  | 699 | ${ }_{7238}^{2693}$ | ${ }_{7782}^{2936}$ | 77 | 3469 | ${ }_{8212}^{3651}$ | 56 | ${ }_{8}^{41389} 8$ |  |  |
|  |  | 6331 | 6205 | 608 | 5954 | 5828 |  | 5576 | 5450 |  | $43 \cdot 1291$ | 1537 | 178 | 2030 |  |  |  |  |  |  |  |
|  | 536 | 5239 |  | 4986 | 4859 | 4731 | 4604 | 4 | 43. |  | 43.5831 | 6880 |  | 657 |  | 咗 | 7323 | 7572 | P20 |  |  |
|  |  | ${ }_{3}^{4058}$ | ${ }_{2027}^{4020}$ | ${ }^{3992}$ | ${ }^{36688}$ | ${ }^{3635}$ |  | 3378 | 324 | 86.32 |  | 15 | ${ }_{541}^{087}$ | 5673 | ${ }_{5}^{1326}$ | 18180 | ${ }_{6} 6344$ |  |  |  |  |
|  |  |  |  |  | ${ }^{1573}$ |  |  | .080 |  |  |  |  |  | ${ }^{22} 20$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | , |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 2 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $27^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | 11 | $12^{\prime}$ | $13^{\prime}$ | 14 | $15^{\prime}$ | 16 | $17^{\prime}$ | 18 |  |  |  | $12^{\prime \prime}$ |  | $14^{\prime}$ | $15^{\prime}$ |  |  |  |  |  |
|  | 8897 | 8895 | 8894 | 8893 | 8892 | 8890 | 88 | 8888 | 8886 |  |  | 4568 | 4571 | 4574 | 4576 | 4579 | 4581 | 84 | 86 | 89 |  |
|  | 7794 | 779 | 77 | 77 | \％ | 77 |  |  |  | 1.7 | 132 | 913 | 9142 | 9147 | 9152 | 9157 | 9163 | 9168 | 9173 | 9178 |  |
|  | 6690 | 6686 |  | 66 | 6 | 6671 |  | 6603 | 6659 | 26655 | 13697 | 3705 | 3713 | 3721 | 3728 | 3736 | 3744 | 3752 | 3759 | 376 |  |
|  | 558 | 558 | 557 | 5571 | 5566 | 5561 | 5555 |  | 5545 | $3 \cdot 5539$ | －8263 | 827 |  | 8294 | 830 | 83 | 8325 | 8336 | 8346 | 矿 |  |
| 5 | 4484 | 4477 | 4471 | 4464 | 4458 |  |  |  |  | 4.4424 | 2.2829 | 2842 | 285 | 28 | 288 | 2894 | 290 | 292 | 2932 | 2945 |  |
| 6 | 3381 | 33 | 3365 |  |  | 3341 |  | 3325 | 3317 | 5.3309 | 2.7395 | 74 | 74 | 74 | 45 | 747 | 20 | 75 | 7519 | 7534 |  |
|  | 227 | 2268 |  |  |  | 2231 | 2222 | 22 | 2203 |  |  | 19 | 19 | 20 | 203 | 205 | 20 | 20 | 2105 | 2124 |  |
|  | 117 | 11 | 1153 | 1143 | 1132 | 121 | 1111 |  | 1089 | 7.1 | 3.6526 | 6547 | 65 | 6589 | 66 | 6630 | 6651 | 6671 | 2 | 6713 |  |
|  | 0071 |  |  |  |  | 0012 | 1000 |  | 9976 |  |  |  | 1310 | 162 | 18 | 1209 | 23 | 1255 | 278 |  |  |
| 10 | 8968 | 8955 |  | 8928 | 15 | 02 | 8888 | 8875 | 8862 | 8.8 | 8 | 5684 | 5710 |  | 576 | 578 | 581 | 5839 | 5865 | 5891 | 0 |
| 11 | 7865 | 7850 | 7836 | 7821 | 7807 | 7792 | 7777 |  |  | $9 \cdot 7733$ | 228 | 0252 |  | 0309 | 0338 |  |  |  |  |  | 1 |
| 12 | 6762 | 67 | 67 |  |  |  |  |  | 6634 | 10.66 |  | 482 | 4852 | 4883 | 4914 | 494 | 497 |  |  |  | 12 |
| 13 | 565 |  |  |  | 5590 | 5572 | 5555 | 553 | 55 | 11.550 | ．93 | 9389 | 9423 | 9456 | 9490 | 952 | 9557 | 95 | 9624 | 9658 | 13 |
| 14 | 4556 | 4537 | 451 |  | 4481 | 4462 | 4444 | 44 | 440 | 124388 | 6．392］ | 3957 | 3994 | 4030 | 40 | 4102 | 4139 | 4175 | 421 | 4247 | 14 |
| 15 | 345 |  |  |  |  | 353 |  |  | 3293 | 13.3273 | 6.8487 | 8526 | 85 | 8603 | 8642 | 8681 | 872 | 8759 | 8797 | 8836 | 15 |
| 16 | 2349 | 2328 | 2307 |  | 2264 | 2243 | 2221 | 2200 | 2179 | 14 | 73053 | 30 | 313 | 31 | 321 | 3260 | 3301 | 33 | 3384 | 3425 | 16 |
| 17 | 124 | 122 | 12 | 1178 | 1156 | 1133 | 1110 |  | 1065 | 15 |  |  |  |  |  |  |  |  |  |  | 17 |
| 18 | O 14 | 01 |  |  |  | 23 |  | 9975 | 9951 | 15.9 | 8.218 | 2231 | 2278 | 2324 | 2371 | 2417 | 2464 | 2510 | 2557 | 2603 | 18 |
| 19 | 04 |  | 8989 | 8964 | 8939 | 13 | 8888 | 8863 | 883 | $16 \cdot 8$ | 8.675 | 6799 | 68 | 6898 | 69 | 69 | 70 | 7094 | 7143 | 7193 | 19 |
| 20 | 7936 | 7910 | 7883 | 7857 | 7830 | 03 | 77 | 77 | 7723 | 17．769 | 9.1316 | 1368 | 1420 | 1471 | 152 | 157 | 1627 | 1678 | 1730 | 178 | 20 |
| 21 | 6833 | 6805 | 6777 | 675 |  |  |  |  |  | 18.658 | 9.5882 | 5936 | 5991 |  | 6099 | 61 | 6208 | 6262 |  |  | 21 |
| 22 |  | 57 |  | 56 |  |  |  | 5525 |  | 19.5 | 10.04 | 0505 |  |  | 06 | 07 | 0789 | 0846 | 0903 | 960 | 22 |
| 23 | 462 | 459 | 45 | 45 | 45 | 4474 | 44 | 44 | 4382 | 20 | $10 \cdot 50$ | 50 |  | 5192 | 525 | 53 | 5370 |  | 5489 | 54 | 23 |
| 24 | 3524 |  |  |  |  |  | 33 |  | 3268 | 21.323 | 10.95 | 9641 | 97 | 976 | 9828 | 9890 | 9952 | 14 | 0076 | 013 | 24 |
| 25 | 2421 | 2387 | 235 | 23 | 22 | 2254 | 2221 | 2188 | 2154 | $22 \cdot 2121$ | 11.41 | 421 | 4274 | 433 | 4404 | 446 | 453 | 4598 | 466 | 472 | 25 |
| 26 | 13 | 1283 | 1248 | 1214 | 1179 | 1144 | 1110 | 1075 | 1040 | 23 | 11. | 8778 | 8845 | 3913 | 898 | 9047 | 9114 | 9182 | 9249 | 9316 | 26 |
| 27 | 0214 | 017 | 014 |  |  |  |  |  |  | 23 ＇989 | $12 \cdot 32$ |  |  |  |  | 362 | 3696 |  |  |  |  |
| 28 | 911 |  |  |  | 8962 |  | 876 | 8850 | 8813 | $24 \cdot 877$ | 12.78 |  |  | 806 | 8132 | 820 | 8277 | 8349 | 842 |  | 28 |
| 29 | 8008 | 796 |  |  |  | 7815 | 7776 | 773 |  |  | 13.2 |  | 2558 |  |  |  | 2858 | 2933 | 3008 |  | 29 |
| 30 | 6905 | 6865 | 6825 | 6785 | 6745 | 6705 | 6665 | 6625 | 6585 | 26.6545 | 13.6974 | 7052 | 7129 | 7207 | 7285 | 7362 | 440 | 517 | 7595 | 7672 | 30 |
| 31 | 580 |  | 571 |  |  |  |  |  |  | 27.543 | $14 \cdot 1540$ |  |  |  |  |  |  |  |  |  |  |
| 32 | 469 | 465 |  | 45 |  |  |  | 4400 | 43 |  | 14. |  |  | 635 | 6437 | 6520 | 6602 |  | 6768 | 6851 | 32 |
| 33 | 359 | 355 | 350 | 3464 | 3420 | 3376 | 3332 | 3288 | 32 | $29 \cdot 32$ | 15.06 |  | 08 | 092 | 10 | 10 |  | 1269 | 1354 |  | 33 |
| 3 | 2492 |  |  |  |  | 2266 | 2221 |  | 210 | $30 \cdot 20$ |  |  |  | 550 |  |  | 5765 | 5853 | 594 |  |  |
| 35 | 1389 | 1342 | 1296 | 12 | 1203 | 1156 | 09 | 106 | 10 | 31.0969 | 15 | 9894 | 9984 | ． 07 | 016 | 02 | 03 | 043 | 052 | 06 | 35 |
| 36 | 028 | 02 | 0190 | 0142 | 0094 | ＋046 | 9998 | 9950 | 9902 | 31.9854 | $16^{6} 436$ | 4462 | 4555 | 4648 | 4742 | 4835 | 4928 | 5021 | 5114 | 520 | 36 |
| 37 | 9182 | 9133 |  |  |  |  | 8887 | 8838 |  | $32 \cdot 873$ | 16 |  |  |  | 9318 |  |  | 9605 | 700 |  |  |
| 38 | 80 | 8029 |  |  |  |  | 7776 | 7725 | 7675 | 33 | 17.3 | 35 | 3697 | 379 | 38 |  | 40 | 4189 | 4287 | 438 |  |
| 39 | 69 | 692 | 687 | 682 |  |  |  | 6613 |  | 34.65 | 17 |  | 82 |  | 84 |  |  | 8772 | 887 | 397 |  |
| 40 | 5873 | 5820 | 5767 | 5713 |  | 5607 | 5554 |  |  | 35．539 | 18.2632 | 2736 | 2839 | 2943 | 3046 | 3150 | 3253 | 3356 | 3460 | 356 |  |
| 41 | 477 | 4715 | 466 | 460 |  |  |  |  |  | 36．427 |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 366 | 36 | 35 |  |  |  |  |  |  |  |  |  | 1981 |  |  |  | 2416 | 2524 | 2633 |  |  |
| 43 | 2563 | 25 | 245 |  |  | 22 | 2220 | 2163 | 21 | 204 | －63 | 64 | 6552 | 66 | 677 |  |  | 7108 | 21 |  |  |
| 44 | 1460 | 402 | 1343 |  |  | 1168 | 1109 | 1050 | 0992 |  |  | 100 | 1123 | 1237 | 135 | 146 | 1578 | 169 | 180 | 192 | 44 |
| 45 | 035 | 029 | 023 |  |  | ＋058 |  |  |  | 18 | 20 | 557 | 5694 | 581 |  | 604 | 6160 | 627 | 639 | 65 | 45 |
| 46 | 9254 | 9193 |  |  |  | 8948 | 8887 |  | 8764 | $40 \cdot 8703$ | $21 \cdot 0027$ | 0146 | 0265 | 038 |  |  |  |  |  |  |  |
|  | 8151 |  |  |  |  | 7838 | 7775 |  |  | 41.758 | $21 \cdot 45$ | 4714 | 4836 | 4958 |  |  | 322 |  | 5565 |  |  |
| 48 | 7047 | 69 | 692 |  | 67 | 672 |  |  | 65 | 42.6 | 21 |  |  | 95 |  | 97 |  | ＋02 | 015 | 027 |  |
| 49 | 59 | 58 | 58 |  |  | 5618 | 5553 |  | 5422 | $43 \cdot 535$ | 22.37 |  | 39 | 410 | 423 | 43 | 44 | 461 | 173 |  | 49 |
| 50 | 4841 | 4775 | 4708 | 4642 | 4575 | 4509 | 4442 | 4375 | 4309 | 44.4242 | 22.8290 | 8420 | 8549 | 8678 | 8808 | 8937 | 9066 | 19 | 325 |  | 50 |
| 51 | 37 | 3670 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 26 | 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 1532 |  |  |  |  | 1179 | 1108 | 1038 | 0967 | 47.089 | 24 | 2125 | 22 | 239 | 2536 | 26 | 2810 | 2947 | 308 |  |  |
| 54 | 0428 | 035 | 02 |  | 0141 | ＋069 |  |  |  | 47 |  |  | 68 | 697 | 71 | 725 |  | 7531 | 767 | 7810 |  |
| 55 | 9325 | 925 | 917 |  | 9033 | 59 |  |  | 87 | 48.8666 | 25 | 1262 | 1404 | 54 |  | 183 | 1 | 115 | 2257 |  |  |
| 56 | 8222 | 8148 |  |  |  | 7850 |  |  | 7626 | 49.7551 | $25 \cdot 568$ |  |  |  |  |  |  |  |  |  |  |
| 57 | 7119 |  |  |  | 6816 | 6740 | 6664 |  | 6512 | 50．6436 | 26.02 |  |  |  |  |  |  | 1283 |  |  |  |
| 58 | 6016 | 59 |  | 578 | 57 |  | 55 |  | 53 | 51．53 |  |  |  |  |  |  | 5717 | 5867 | 601 | 616 |  |
| 59 |  |  |  |  |  | 45 | 4442 | 4363 |  | － 20 |  | 95 | 9688 | 08 |  | 11 | 208 | 45 | 060 |  |  |
| 60 | 3809 | 3730 | 3650 | 3570 | 3490 | 3410 | 3330 | 3250 | 3170 | 53.3090 | $27 \cdot 3948$ | 4104 | 4259 | 4414 | 45 | 472 | 4880 | 5035 | 5190 | 534 |  |
| 61 | 27 | 262 | 254 |  |  | 2300 |  |  |  |  |  |  |  |  |  |  | 961 | 961 |  |  |  |
| 62 | 16 |  |  |  | 1273 | 119 | 1108 |  |  |  |  |  |  |  |  |  |  |  | 43 |  |  |
| 63 |  |  |  |  |  | ＋101 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 64 | 9397 | 931 | 922 |  |  | 897 | 8886 | 8800 | 87 | 56.8630 | $29 \cdot 22$ | 23 | 254 | 27 |  |  |  |  | 353 |  |  |
| 65 | 829 |  |  |  |  | 7861 |  |  |  | 57.7514 | 29.677 |  | 7114 |  |  | 7618 |  |  | 8122 |  |  |
|  | 7190 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 608 | 599 |  |  |  | 564 |  |  |  | 59．5284 |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 49 | 489 |  |  | 4622 | 4532 | 444 | 435 | 426 | 60\％416 | 31．0475 | 06 | 082 | 100 | 117 |  | 15 | 17 | 1882 | 20 |  |
| 69 | 388 |  |  |  |  |  |  |  |  | 3054 |  | 5219 | 539 |  | 砣 |  | 位 | 206 |  |  |  |
| 70 | 2778 | 268 | 259 | 24 | 2405 | 2312 | 2219 | 212 | 2032 | 62.193 | 31 | 978 |  | 15 |  |  | 069 | 087 | 05 |  |  |
| 71 | 167 | 158 | 1486 | 1391 | 1297 | 1202 | 1108 |  |  | 63 | 32 | 43 | 4 | 672 |  |  | 52 |  |  |  |  |
|  | 057 |  |  |  |  | ＋092 |  |  | 980 | $63^{\circ}$ | 32－87 | 89 | 91 | 92 |  |  |  |  | 02 |  |  |
| 73 | 9468 | 937 | 9274 |  |  | 8982 | 8885 |  | 869 | 64：85 |  |  | 矿 | 810 |  |  |  |  | 481 |  |  |
| 74 | 8365 | 82 | 析 | 8070 | 7971 | 矿 | 7774 | 7675 | 757 | 657478 | 33.78 | 806 | 8252 | 844 | 863 | 882 | 90 | 920 | 940 | 95 |  |
| 75 | 72 |  |  |  |  | 6763 |  |  | 6463 | 6363 | 34.2435 | 2629 | 23 | 3017 | 321 | 34 | 3599 | 37 | 398 | 41 | 75 |
| 76 | 6158 | 6057 |  |  |  | 5653 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 77 | 5055 | 4953 | 485 | 47 |  | 4543 | 44 | 43 | 4235 | 68.413 |  | 17 | 195 | 216 | 23 | 251 | 73 |  |  |  |  |
| 78 | 295 |  |  |  | 3537 | 3433 | 3329 | 3225 | 3121 | 69．3017 | $35 \cdot 613$ | 6335 | 6536 | 673 | 694 | 7142 | 73 | 75 | 774 | 18 |  |
| 79 | 2849 | 2744 | 2639 | 334 | 2429 | 232 |  | 113 |  | 70.1902 | 36.069 | 9 | 107 | 131 | 151 | 172 | 525 | 12 |  |  |  |
| 80 | 1746 | 1639 | 1533 | 1427 | 20 | 1214 | 1107 | 1000 | 0894 | 71.0787 | 36.526 | 547 | 567 | 588 | 609 | 629 | 650 | 671 | 692 | 712 | 80 |
| 81 | 06 | 0535 | 0427 | 0320 | 0212 | 1104 | 9996 | 9888 | 9780 | 1.967 | $36^{\circ} 98$ | ＋040 | 0249 | 045 | 066 | 087 | 1087 | 12 |  | 171 |  |
| 8 | 935 | 832 | 821 |  |  | 788 | 777 |  | 8666 | $72 \cdot 855$ | 37－4396 | 460 | 4820 | 503 | 524 | 5 | 56 | 588 | 60 | 63 |  |
| 83 | 843 | 832 | 821 | 81 | 7995 | 7884 | 7774 | 7563 | 7552 | $73 \cdot 744$ |  |  | 391 |  |  | （1as | ， | 5068 | 067 |  |  |
| 84 | 333 | 721 | ， |  |  | 6774 | 6662 | 6551 | 6438 | 74．632 | 38．352 | 3745 | 3962 | 4180 | 439 | 461 | 4831 | 5048 | 526 | 548 |  |
| 85 | 623 | 6117 | 6004 |  |  | 5665 |  | 5438 | 5325 | 7531 | 38 | 8313 |  | 875 | 8973 | 9193 | 4 4 | 9632 | 9852 | － | 85 |
| 86 | 5127 | 5012 | 4898 | 4784 | 69 | 4555 | 4440 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4024 | 3908 |  | 3677 | 3561 | 34 | 33 | 3213 | 3097 | 77•2981 | 39.7225 | 745 | 7675 | 790 | 812 | 8350 | 85 | 880 | 921 | 925 | 87 |
| 88 | 2920 | 280 | 2686 | 2569 | 2432 | 235 | 18 | 2101 | 983 | 78.1866 | 40．17 | 2018 | 2246 | 247 | 2701 | 292 | 3157 | 3384 | 361 | 383 |  |
| 89 | 1817 | 1699 | 1581 | 1462 | 1344 | 1225 | 1107 | 0988 | 0869 | 79.0751 | 40 | 6587 | 6817 | 784 | 7278 |  | 7738 | 7968 | 819 |  | 39 |
| 90 | 071 | － | 047 | 砣 | 0235 | ， | 999 | 9876 | 9755 | 79.9635 | 41.0922 | 1155 | 1388 | 162 | 1854 | 208 | 231 | 2552 | 278 | 301 | 90 |
| 9 | 961 | 9490 | 源 | 248 |  |  |  |  |  | 80：8520 | 41：548 | 572 | 5959 | 619 | 643 | 666 | 69 | 7136 | 737 | 760 |  |
| 9 | 850 | 8385 | 8263 | 8141 | 18 | 7896 | 7773 | 765 | 7528 | － | 42.0054 | 0292 | 0530 | 276 | 1006 | 24 | 48 | 1720 | 958 | 位 | 92 |
| 93 | 7404 | 7281 | 7157 |  |  | 6786 | 6662 | 6538 | 6414 | 82．6290 | $42 \cdot 462$ | 4860 | 5101 | 534 | 5582 | 582 | 605 | 6304 | 654 | 67 | 93 |
| 95 | 630 | 6176 | 6051 |  |  | 5676 | 5s51 | 5426 | 5300 | 175 |  | 42 | 9672 | 991 | ＋158 | 20 | 0645 | 088 | 113 | 37 | 94 |
| 95 | 51 | 5072 | 4946 | 4819 | 4693 | 456 | 4440 | 4313 | 4186 | 84•4060 | 43 | 4 | 4243 |  | 4735 | 498 |  | 547 | 5717 |  | 95 |
|  |  |  |  |  |  | 3456 | 3329 | 3201 | 3073 | 85.2944 | 43.831 | 8566 | 881 | 906 | 9311 | 955 | 9807 | ， |  |  |  |
| 97 98 | 18892 | 1758 | 2734 1628 | 1498 |  |  | 22 | 2088 | 1959 | $86 \cdot 182$ | $44^{2} 288$ | 313 | 338 | 36 | 3887 | 413 | 43 | 46 | 4890 | 514 |  |
|  |  |  |  |  |  | 27 | 17995 |  |  |  |  |  |  | 226 | 8463 | 871 | 8970 | 9223 | 9477 | 9730 | 98 |
| 100 | 9682 | 549 | 9416 | 9283 | 1150 | 9017 | 8884 | 8751 | 8617 | 88．8484 | 45.2615 45.6580 | 6839 | 7098 | 7357 | 3039 | 7874 | 8133 | 8391 | 8650 | 3908 | 998 |
|  | $50^{\prime}$ | $49^{\prime}$ | 48＇ | 47 | 46 | $45^{\prime}$ | $44^{\prime}$ | $43^{\prime}$ | $42^{\prime}$ |  |  |  |  |  | 7615 | ， | 813 |  |  |  | 10 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $27^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | $21^{\prime}$ | $22^{1}$ | 23 | $24^{1}$ | $25^{5}$ | 26 | 27 | 28 | 29 | 20 | $21^{1}$ | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | 26 | 27 | $28^{\prime}$ |  |  |
|  | 888 | 88 | 8881 | 8879 | 88 | 8877 | 88 | 8874 | 8873 | ． 887 | 4592 | 94 | 45 | 4599 | 4602 | 4605 | 4607 | 4610 | 4612 | 4615 |  |
| 2 | 硡 | 7764 | 2 |  | 775 | 77 |  |  |  |  | 83 | 918 | 9194 | 91 | 204 | 9209 | 9214 | 9219 | 223 |  |  |
| 3 | 6651 | 6646 | 6642 | 6638 | 6634 | 6630 | 6626 |  |  |  | 1.3775 | 3783 | 3790 | 37 | 38 | 3814 | 3821 | 3829 | 3837 | 3845 |  |
| 4 | 5534 | 5529 | 5523 | 5518 | 5513 | 5507 | 5502 | 5497 |  |  | －8367 | 8377 | 8387 | 83 | 84 | 8418 | 3429 | 8439 | 8449 | 8460 |  |
| 5 | 4418 | 4 | 4404 |  |  | 4384 | 4377 |  |  |  |  |  | 2984 | 2997 | 3010 | 3023 | 3036 |  | 3062 |  | 5 |
| 6 | 3301 | 3293 | 3285 | 3277 | 3269 |  |  | 3245 | 3237 | $5 \cdot 3229$ | 27550 | 505 | 758 | 7596 | 7612 | 7627 | 7643 | 7658 | 7674 | 7689 |  |
| 7 | 218 | 75 |  |  | 2147 |  |  |  | 2110 |  |  | 2160 | 217 | 219 | 2214 | 2 | 2250 |  | 2286 | 2304 |  |
| 8 | 1068 | 1 | 4， 4 | 1036 | 1025 | 析 | 1004 |  |  | 7.097 | 3.6733 | 6754 | 67 | 679 | 1 | 6837 | 68 | 6878 | 6899 | 6919 |  |
|  | 99 |  |  |  |  |  |  | 867 | 9855 |  |  | 348 | 137 | 139 | 1418 | 1441 | 146 | 148 | 1511 | 1534 |  |
| 10 | 8835 | 22 | 8808 | 8795 | 8782 | 8768 | 55 | 8741 | 8728 | ． 871 | 4.5917 | 5942 | 5968 | 5994 | 6020 | 6046 | 607 | 6097 | 6123． | 6149 | 0 |
| 11 | 77 | 7704 | 7689 | 7674 | 7660 | 7645 | 7630 | 7615 |  |  |  | 053 | 0565 | 10594 | 06 |  |  |  | 6 |  |  |
| 12 | 6602 | 6586 | 6570 | 6554 |  |  |  |  | 6474 | 1 |  | 5131 | 5162 | 5193 | 5224 | 5255 | 5286 | 5317 | 48 | 5379 | 2 |
| 13 | 5486 | 5468 | 5451 | 5433 | 5416 | 5399 | 5381 | 64 | 534 | 11.532 | 5.969 | 9725 | 975 | 979 | 9826 | 986 | 9893 | 992 | 99 | 9994 | 13 |
| 14 | 4369 | 4350 | 4332 | 4313 | 4294 | 4275 | 4257 | 4238 | 4219 | 420 | 6.4283 | 4319 | 435 |  | 4428 | 446 | 4500 | 4536 | 4573 |  | 14 |
| 15 | 32 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9185 |  | 15 |
| 16 | 2136 |  |  | 2072 | 2050 |  |  | 1986 | 1965 | 14．1943 | $7 \cdot 3467$ | 3508 | 3549 | 3591 | 3632 | 3673 | 3715 | 3756 | 3797 | 3838 | 16 |
| 17 | 10 | 0997 | 0974 | 09 | 0929 |  |  |  | 08 |  |  | 8102 | 81 |  |  | 8278 | 8322 |  | 8410 |  | 17 |
| 18 | 99 |  |  |  |  |  |  | 9734 | 9710 | 15 | 2650 | 269 | 27 | 2789 | 2836 | 2882 | 2929 | 2975 | 3022 | 3068 | 18 |
| 19 | 8787 | 8761 | 8736 | 8710 | 8685 |  | 8634 | 8609 | 8583 | 16.855 | 72 | 729 | 73 | 7389 | 7438 | 748 | 7536 | 75 | 7634 | 768 | 19 |
| 20 | 7670 | 7643 | 7617 | 759 | 756 | 7536 | 7510 | 7483 | 7456 | 17742 | 83 | 1885 | 193 | 98 | 204 | 209 | 2143 | 219 | 2247 | 2298 | 20 |
| 21 | 655 | 65 | 6497 | 6469 | 6441 | 6413 | 6385 | 6357 | 6329 |  | 9.6425 | 647 | 6533 | 16588 | 66 | 6696 | 6750 |  |  |  | 21 |
| 22 | 543 |  |  |  |  |  |  | 231 | 201 | ， | $10 \cdot 1017$ |  |  |  | 44. | 1301 |  |  |  |  | 22 |
| 23 | 432 | 4290 | 425 | 4228 | 41 | 4167 | 36 | 4105 | 4074 | 20＇404 | 10 | 56 | 57 | 5787 | 46 | 59 | 5965 | 60 | 6083 | 6143 | 3 |
| 24 | 32 | 3 | 3140 |  |  | 3044 |  |  | 2947 | 21.29 | 11.0200 | 02 | 03 | 038 | 0448 | 05 | 05 |  | 0696 | 0758 | 24 |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  | 4921 | 4985 | 05 | 5115 | 5179 | 5244 | 5308 | 37 | 25 |
| 26 | 09 |  |  |  |  |  |  |  |  | 23.065 | 11.9383 | 9450 | 9518 | 9585 | 9652 | 9719 | 9786 | 9853 | 9920 | 9988 | 26 |
| 27 | 98 | 9818 | 9782 | 9746 | 9710 | 967 |  |  |  |  |  | 4045 | 41 | 4184 | 4254 | 4324 | 4393 | 44 |  | 460 | 27 |
| 28 |  |  |  |  |  |  | 8513 | 8476 | 8438 | 24.840 | $12 \cdot 8567$ | 86 |  | 87 | 8856 | 89 | 9001 |  | 9145 | 217 | 28 |
| 29 | 7622 |  | 7544 |  |  |  |  | 7350 | 73 | 25.727 | 13.3158 | 32 | 3308 | 3383 | 345 | 3533 | 3608 | 3683 | 3757 | 383 | 29 |
| 30 | 6505 | 6465 | 6425 | 6385 | 6345 | 6304 | 6264 | 6224 | 6184 | 614 | 13.7750 | 78 | 7905 | 7982 | 306 | 813 | 821 | 82 | 8370 | 8447 | 30 |
| 31 | 5389 | 5347 | 5306 | 5264 | 5223 | 5181 | 5140 | 5098 | 5057 | 27.5015 | 14.2342 | 2422 | 2502 | 2582 | 2662 | 2742 |  | 2902 |  |  | 1 |
| 32 | 42 |  |  |  |  |  |  |  |  | 28.38 | 14.693 |  |  |  | 析 |  |  |  |  |  | 32 |
| 33 | 315 | 3111 | 306 | 302 | 2979 |  | 2891 | 2846 | 2802 | 29.275 | 15 | 1610 |  | 17 | 1866 | 195 | 2036 | 2122 | 2207 | 229 | 33 |
| 34 | 203 | 1994 | 1948 |  |  |  |  |  |  | 30．162 | 15 | 620 |  | 631 | 666 | 65 | 6644 | 6731 | 6819 | 907 | 34 |
| 35 | 0923 | 0876 |  |  |  |  |  |  |  |  | $16^{\circ} 0708$ | 07 | 0889 | 0980 | 1070 |  | 125 | 1341 |  | 52 | 35 |
| 36 | 9806 |  |  |  |  |  |  |  |  | 31.937 | 16.530 | 539 |  |  | 5672 | 5765 | 5858 |  | 6044 |  | 36 |
| 37 | 869 | 8640 | 8591 | 854 | 8492 |  |  | 8343 | 829 |  |  |  |  |  |  |  |  |  |  |  | 37 |
| 38 | 75 |  | 7472 |  |  |  | 7268 | 7217 | 7166 | 33 | 17¢44 | 45 |  | 4778 | 487 | 4974 |  | 5170 |  |  | 38 |
| 39 | 6457 | 6404 | 6352 |  |  |  | 6144 | 609 | 60 |  |  | 91 |  | 9377 | 947 | 95 | 967 | 9780 | 9881 | 998 | 39 |
| 40 | 5340 | 5287 | 5233 | 180 | 512 | 507 | 5019 | 4965 | 4912 | 35＇4858 | 18.36 | 377 | 3873 | 3977 | 408 | 418 | 428 | 43 | 4493 | 59 | 40 |
| 41 | 4224 | 4169 | 4114 | 4059 | 4004 | 3949 | 3894 | 3839 | 3785 | 36．3729 | 18.8258 | 8364 | 8470 | 8576 | 8682 | 8788 |  |  |  |  | 41 |
| 42 |  |  |  |  |  | 2826 |  |  |  | $37 \cdot 2601$ | 19.28 |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 199 | 1933 | 18 | 1818 | 1761 |  |  |  | 1530 | $38 \cdot 14$ |  |  |  |  |  |  |  |  |  |  | 43 |
| 44 | 087 | 0815 | 075 |  |  |  |  |  | 0403 | 39.0344 | 20．2033 | 2147 |  | 235 |  | 2602 | 2715 | 829 | 2942 | 05 | 44 |
| 45 | 9758 | 9697 | 9637 |  |  |  | 939 | 9336 | 9276 | 39．9215 | ， | 674 | 6857 |  |  | 720 | 32 |  | 7555 | 67 | 45 |
| 46 | 864 |  |  |  |  |  |  |  |  |  | 21 |  | 14 |  |  |  |  |  |  |  | 46 |
| 47 | 75 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 47 |
| 48 | 640 |  |  | 6216 | 6151 | 6087 | 6023 | 5958 | 589 | 42.5830 | 22.04 |  |  |  |  |  | 1144 |  | 1392 | 51 | 48 |
| 49 | 5292 | 5226 | 5 |  |  |  | 4898 | 48 | 476 |  |  |  |  |  |  |  |  |  |  |  | 49 |
| 50 | 4175 | 4108 | 4042 | 397 | 39 | 3841 | 37 | 370 | 364 | 44.3573 | 22.9583 | 9712 | 9842 | 9971 | 110 | 02 | 0358 | 0487 | 61 | 074 | 50 |
| 51 | 3059 | 2990 |  |  |  | 2718 | 2649 | 2581 | 2512 | 45.2444 | 23.417 |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 1942 |  |  |  |  |  | 1525 | 1455 | 1385 | 46 |  |  |  |  | 9304 |  |  |  | 841 |  | 52 |
| 53 | 082 | 07 | 068 | 061 | 0542 | 0471 | 0400 |  |  |  |  |  |  |  |  |  |  | 4316 |  |  | 53 |
| 54 | 970 |  |  |  |  | 9348 | 76 | 9203 | 9131 | 47 | $24 \cdot 7950$ |  | 8229 | 8368 | 50 | 864 | 8787 | 92 |  | 20 | 54 |
| 55 | 8593 | 8519 | 844 | 837 | 829 | 8225 | 8151 | 8077 | 8004 | 48.79 | 5.25 | 析 | 826 | 2968 | 311 | 325 | 3394 | 3536 | 678 | 88 | 55 |
| 56 | 74 |  |  |  |  |  |  | 6952 | 687 |  |  | 727 |  |  |  |  |  |  |  |  | 56 |
| 57 | 63 |  | 62 |  |  |  |  |  |  | 50.5673 | $26^{\circ}$ |  |  |  |  |  |  |  |  |  | 57 |
| 58 | 52 | 5166 |  |  |  | 4855 |  | 00 | 4622 | 51 | 26 |  | 6616 |  |  |  |  |  | 7515 | 766 | 58 |
| 59 | 412 | 404 |  |  | 3811 | 37 | 3653 | 357 | 34 |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 | 30 | 2930 | 285 | 27 | 26 | 26 | 29 | 2448 | 236 | 53.2287 | 27 | 655 | 5810 | 5965 | 6120 | 6275 | 6430 | 6585 | 6740 | 689 | 60 |
| 61 | 1894 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 077 |  |  |  |  |  |  |  |  | 55．0030 | $28 \cdot 46$ | 4843 | 5004 |  | 532 |  | 5644 | 5804 |  | \％2 | 62 |
| 63 | 96 | 95 | 949 | 940 |  | 9239 |  |  |  | 5 |  |  |  |  |  |  |  |  |  |  | 63 |
| 64 | 85 | S |  |  |  |  |  |  |  | 56.777 |  |  | ， | 4363 |  |  |  | 5024 | 5189 |  | 64 |
| 65 | 742 |  | 725 |  |  |  |  | 681 | 673 | 57.66 | $\cdot 84$ | 8626 | 879 | 896 |  |  | 946 | 9633 | 9801 |  | 65 |
| 66 | 631 | 622 |  |  |  | 587 |  |  | 5604 |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 51 | 510 | 50 |  |  |  |  |  | 447 |  |  |  |  |  |  |  |  |  |  |  | 67 |
| 68 |  |  |  |  |  |  |  |  |  | 60 | 31 |  | 258 |  |  |  |  | 346 | 363 |  | 68 |
| 69 | 2962 | 286 | 277 | 2685 |  |  | 240 | 23 | 2223 | 61.213 | 31.68 | 7003 | 7181 | 1760 |  | 7716 |  | O | 280 |  |  |
| 70 | 18 | 17 | 1658 | 1564 | 1471 | 377 | 1283 | 1189 | 1096 | 1002 | ． 14 | 159 | 1778 | 195 | 214 | 232 |  |  |  |  | 70 |
| 71 | 072 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 71 |
|  | 96 |  |  |  |  |  |  |  | 88 | $63 \cdot 87$ | 33.060 | 07 | 0972 | 115 | 134 | 15 | ， | 1902 | 208 | 砣 | 72 |
| 73 | 849 | 839 | 830 | 8203 | 8105 | 8007 | 6185 | 7812 | 77 | 64.761 | $33 \cdot 519$ | 5380 | 5569 | 575 | 5946 | 6 |  |  | 13 |  | 73 |
|  | 737 |  |  |  |  |  | 6785 |  | 6581 |  | 仡 | 5 | 166 | 257 | 05 |  |  | 5731 |  |  | 74 |
| 75 | 6263 | 6162 | 6062 | 62 | 5862 | 5761 | 5661 | 556 | 5459 | $66 \cdot 53$ | 34．437 | 456 | 476 | 495 | 51 | 53 | 5537 | 573 | 592 | 611 | 75 |
| 76 | 5146 | 504 | 4943 | 4841 |  | 4638 | 453 | 4434 | 433 | $67 \cdot 4230$ | 89 | 91 | 9359 | 955 | 975 | 9948 | 144 | 34 | 053 |  | 76 |
| 77 | 4030 | 392 |  |  |  |  | 3412 |  |  |  |  | 375 | 矿 | 4 | 435 | 4553 | 4751 | 4950 |  |  | 77 |
| 78 | 2913 |  |  |  |  |  |  | 2182 | 2078 |  | $35 \cdot 81$ | 835 | 855 |  | 856 |  | 9359 |  | 9761 |  | 78 |
| 79 | 1797 | 169 | 1586 | 1480 | 1374 | 1268 | 1163 | 105 | 0951 |  | $36 \cdot 27$ | 294 | 315 | 335 | 355 | 3162 | 996 | 417 | 437 |  | 79 |
| 80 | 0680 | 057 | 0466 | 0359 | 0252 | 0145 |  |  |  | 70.9716 |  |  |  |  |  | 836 | 857 | 878 | 898 | 919 | 80 |
| 81 | 956 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 297 | 318 |  | 359 |  |  |
|  | 84 |  | 8228 |  | 8009 | 789 | 7789 | 7679 | 7569 | $72 \cdot 74$ | 37＇65 | 67 | 6940 | 1751 | 73 | 75 | 7787 | 7999 | 821 | 842 | 82 |
|  | 7331 | 7220 | 7109 |  | 6887 |  |  | 6533 | 6442 |  | 381 | 139 | 153 | 175 | 1966 | 278 | 298 | 260 |  |  | 83 |
| 84 | 6214 |  | 5990 | 5877 | 5765 | 56 |  | 5427 | 5315 | 74．5202 | 38.57 | 5917 | 613 | 635 |  |  |  | 21 | 743 | 765 |  |
| 85 | 5098 | 4984 | 4871 | 4757 | 4643 | 4529 | 4415 | 4301 | 4187 | 75－4073 | $39 \cdot$ | 051. | 073 | 0950 | 1170 | 1389 | 1609 | 1828 | 2048 | 22 | 85 |
| 8 | 3981 | 3866 | 3751 |  | 3521 | 3406 | 3291 | 3176 | 3060 | 76．2945 | 39.48 |  |  | 550 | ${ }^{5772}$ |  |  |  | ${ }^{6660}$ |  | 86 |
|  | 286 |  | 2632 |  | 781 | 2283 | 160 | 2050 | 933 | 78. | 39.947 | 9 |  | － | 硣 | 5298 | 0823 | 563 | 1272 | 1497 | 87 |
| 88 | 174 |  | ， | 135 | 1278 | 1160 | 104 | 0924 | 0806 | 78.06 | 40．406 | 429 | 45 | 473 | 497 | 5203 | 5430 | 5657 | 588 | 611 | 88 |
| 89 | 0632 | 0513 | 039 | 0275 | 0156 | －037 | 9917 | 978 | 9679 | 9， | 40＇8658 | 888 | 9118 | 936 | 957 | 980 | 03 | 026 | 049 | 012 | 89 |
| 90 | 951 | 9395 | 9275 | 9154 |  | 8913 | 879 | 8672 | 8551 | 79－843 | $41 \cdot 3250$ | 348 | 3715 | 3947 | 418 | 4412 | 464 | 487 | 510 | 53 | 90 |
| 9 | 839 |  |  |  |  | 矿 | 7668 |  | 229 |  | 41 | 8077 | 8312 | 854 |  |  | 925 | d | 19722 | 995 | 91 |
| 92 | 728 |  |  | 6913 | 67 | 666 | 654 | 64 | 6297 | 82 | 42.24 | 267 | 2909 | 3146 | 3384 | 3621 | 3859 | 409 | 433 | 45 | 92 |
| 93 | 616 | 604 | 5917 | 57 | 5668 | 5544 | 542 | 5294 | 5170 | $82 \cdot 50$ | 42.70 | 7265 | 7505 | 2146 | 258 | 82 | 5406 | 836 | 8946 | 978 | 93 |
| 54 | 5049 | 24 |  | 4672 | 4546 | 4421 | 4295 | 4169 | 4043 | 83.39 | $43 \cdot 16$ | 1859 | 2102 | 234 | 25 | 283 | 3073 | 3316 | 355 | 380 | 94 |
| 95 | 3933 |  |  | 3552 | 342 | 1329 | 3170 | 3043 | 2915 | 84：2788 | 43.6208 | 6454 | 6699 | 6944 | 7190 | 7435 | 7680 | 7926 | 8171 | 8416 | 95 |
| 96 | 281 |  | 2560 | 2431 | 2303 | ${ }^{2174}$ |  | 1917 |  |  | 44.5 | 568 | 5093 |  |  | 2040 | 2288 | 2535 | 278 | 3031 | 96 |
| 97 | 1700 |  | 1441 |  | 185 | 105 | ， | 0791 | O | 8 | 44 | 5642 | 5893 | 6143 | 6394 |  | 6895 | 7145 | 739 |  |  |
|  | 矿 | 0452 | 1 |  |  | 99 | 979 | 9665 | 9534 | 86.940 | 44．9983 | －236 | 0490 | 763 | 095 | 1249 | 1502 | 1755 | 2008 | 226 | 98 |
|  | 9467 | 9334 | 9202 | 析 | 8937 | 8885 | 8672 | 8539 | 8407 | 87．827 | 45.4575 | 迷 | 568 | 534 |  | 5 | 710 |  | 623 | 6876 |  |
| 100 | 3350 | 227 | 8083 | 7949 | 7815 | 7682 | 7548 | 7413 | 7279 | $88^{\circ} 714$ | 45.9167 | 9425 | 9683 | 9942 | 1200 | 0458 | 0716 | 0974 | 1233 | 1491 | 180 |
|  | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | $37^{\prime}$ | $36^{\prime}$ | 35＇ | $34^{\prime}$ | $33^{\prime}$ | 32＇ | 31 | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | 37 | 36 | 35 | $34^{\prime}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $62^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES.

| Cosine. |  |  |  |  |  |  |  |  |  |  | Sixe. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  | 49 | $40^{\circ}$ |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{1}^{1}$ |  |  |  | 8851 |  |  | ${ }^{8867}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 771 |  |  | 7702 |  |  | ${ }_{\text {c }}^{7694}$ |  |  |  | ${ }_{3988}^{9292}$ |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 5400 |  |  |  |  |  | 8583 |  |  |  |  | 5 |  |  |  |  |
|  |  |  |  |  | 3107 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 1978 | 18 | 1959 | 1994 | 1940 |  |  |  |  |  |  |  |  |  |  |  | 7 |  |  |
|  |  | 0842 |  |  | 0810 |  | 0788 | 0777 |  |  | 3.71 | 7167 | 7187 | 7208 | 29 | 724 | 7270 |  |  |  |  |
|  |  | 85938 |  |  |  |  |  |  |  |  |  | 1813 |  |  |  |  | $\xrightarrow{1958}$ |  |  |  |  |
|  |  | 7408 |  |  | 36 |  |  |  |  |  |  |  | 1133 | 116 |  | 1218 |  |  |  |  |  |
|  |  |  |  | $62$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{14}^{15}$ | ${ }_{2829}^{3974}$ |  |  |  |  |  |  |  |  |  | 5068 |  | 9765 |  |  |  |  |  |  |  |
|  | 16 | 1685 | 1663 | 1661 | 162 | 580 | 1576 | 1555 | 1533 |  | 7.42 | ${ }^{4334}$ | 14375 | ${ }^{4616}$ | ${ }^{4657}$ | ${ }^{4998}$ | 15540 | 4581 | 14622 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 18 |  |  |  |  |  |  |
|  |  |  |  |  | 7225 |  |  | 6943 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 596 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 22 |  | ${ }^{4641}$ |  | 357 | ${ }^{4597}$ | ${ }^{4516}$ | ${ }_{3485}^{4838}$ | 36 |  |  | 2586 |  | 6973 | 32 | 1 |  |  |  |  |  |
|  | 24 | 2527 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | $\begin{aligned} & 0237 \\ & 9093 \end{aligned}$ |  | $\begin{aligned} & 01627 \\ & \hline 9020 \end{aligned}$ | ${ }^{1032}$ |  | 006 | ${ }^{1026}$ |  |  | $\begin{aligned} & 12: 0,57 \\ & 12: 531 \end{aligned}$ | $\begin{gathered} 0792 \\ 5438 \\ 5938 \end{gathered}$ |  | $\begin{gathered} 0927617 \\ \hline 957 \end{gathered}$ |  |  |  |  |  |  |  |
| 28 | 28,7986 | 2093 |  | 7872 | 78 | 8787 | 87 | ${ }^{887}{ }^{27}$ |  |  |  | ${ }^{5638}$ | 015 | 557 |  | 0372 | $\begin{aligned} & 5785 \\ & \hline 0646 \end{aligned}$ |  |  |  |  |
|  |  |  |  |  |  | 6566 |  |  |  |  |  | 473 |  |  |  |  |  |  |  |  |  |
|  | 31455 | 4516 | 4472 | 4330 | 438 | ${ }^{3366}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 336 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }^{33}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{array}{\|c\|} \hline 36 \\ 35 \\ \hline \end{array}$ | 599 |  |  |  |  |  |  | 985 |  | 30.9556 | 1572514 |  |  | ${ }_{2785}$ |  |  |  |  |  |  |  |
|  |  | $8794$ | 876 |  | 8646 | 8596 | ${ }^{8547}$ | 8498 | 8449 |  | 167758 | 7250 | ${ }^{7343}$ | 7736 | 7529 | 7621 | 716 | 780 |  |  |  |
| $\begin{aligned} & 37 \\ & 38 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | \% 5600 |  | 5304 | 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }_{1022}^{3067}$ | $\xrightarrow{3011} 1$ | ${ }_{189}^{2956}$ |  | ${ }_{1}^{2865}$ | 1638 | ${ }_{1581}^{23}$ | ${ }_{1524}^{2678}$ |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{43}^{42}$ | ${ }_{3} 10835$ | 077 | 0719 | 066 |  | O545 | 0486 | 042 | 037 |  |  | 977 |  | 9993 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 46 | $7{ }^{7} 7805$ | \% 7 \%3, |  |  |  |  |  |  |  |  |  |  |  |  | 8064 |  | 4301 |  |  |  |  |
|  | ${ }_{8} 5118$ | 505 | 4989 | 49 | 6859 | ${ }^{27946}$ | 472 | 4664 | 459 |  |  | 330 | ${ }_{3124}^{881}$ | 3248 | 3371 |  | 1820 |  |  |  |  |
| 49 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 1620 |  | 148 | 1413 | 134 | 127 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 54 \\ & 54 \\ & 54 \\ & c \end{aligned}$ |  | 818 | 813 | 80 | 7968 | 7893 | 782 | 7767 | 768 |  |  |  |  | 1553 | d293 | $1 / 38$ | 1571 |  |  |  |  |
|  | 57115 | 7041 | 6966 |  | 681 | 6743 |  | 599 |  |  |  | 552 |  |  |  |  |  |  | Tsil |  |  |
|  |  | 58 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0888 | 1032 | 176 |  |  |
|  | 588828 | ${ }^{4} 859$ | ${ }^{4672}$ | 459 | ${ }^{4520}$ | 44433 | ${ }^{4366}$ | 428 | 4215 |  |  | 4813 |  |  |  |  |  |  |  |  |  |
| 5 | 992542 | ${ }^{2662}$ | ${ }^{2382}$ | 230 | ${ }^{2223}$ | 143 |  |  | 19 |  |  |  |  | ${ }_{4}^{4409}$ |  |  | 4884 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\left.\begin{aligned} & 63 \\ & 64 \end{aligned} \right\rvert\,$ | [3] 78988 | 788 <br> 673 | 779 | ${ }_{656} 71$ | ${ }^{7627}{ }^{7679}$ | ${ }^{7592} \times 1$ | ${ }^{7635}$ | ${ }_{621}^{737}$ | ${ }^{7286}$ |  |  | ${ }^{2683}$ | ${ }^{2859}$ | ${ }^{3013} 7$ | 3175 | ${ }^{33937} 7$ | ${ }^{3845} 8$ |  |  |  |  |
|  |  |  |  | 5418 | 5330 |  |  | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{6}^{6}{ }_{6}^{63398} 5$ | ${ }_{3}^{4394}$ | ${ }_{3214}^{4360}$ | 312 | 303 | 2962 |  |  |  |  |  | ${ }^{6626}$ |  |  |  |  |  |  |  |  |  |
| $\begin{gathered} 67 \\ 68 \\ 68 \end{gathered}$ | ${ }_{8} 2251$ | 216 | 208 | 1976 | 1884 | 1792 | 1699 | 1607 | 1515 |  |  | 15917 | 6093 | 6268 | 6463 | 6618 | 6793 | 696 | 71 |  |  |
|  |  | 1015 | 9776 | 0888 | O58 | 0641 | ${ }^{0548}$ | 0.54 | 036 |  |  | 520 |  |  |  |  | 1652 |  |  |  |  |
|  | ${ }^{18821}$ | 872 | 8829 | 8533 | ${ }^{8437}$ | ${ }^{8341}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 7 \\ & 7 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 73 \\ & 74 \\ & 7 \end{aligned}$ | 45391 | 529 | 5191 | 5091 | 4991 | 4891 | 479 | 469 | 559 |  |  |  | ${ }^{3938}$ | 4176 | 4364 | 4555 | 4785 | 623 |  |  |  |
|  |  |  | 4045 |  |  |  | 363 | ${ }_{33}$ | 3436 |  |  |  |  |  | 9018 |  |  |  |  |  |  |
| $76$ | ${ }^{6} 103051$ | 300 | ${ }^{288}$ | 127 | ${ }^{2633}$ | 139 | ${ }^{248}$ |  | 228 |  |  |  |  |  |  | ${ }^{3887}$ | ${ }^{4063}$ | 425 | 445 |  |  |
| $77$ |  |  | 063 |  | 2395 | ${ }^{1290}$ | ${ }^{1338}$ | 123 | 1127 |  |  |  |  | ${ }_{8}^{8127}$ |  | 18523 |  |  |  |  |  |
| 79 |  |  |  |  |  |  |  |  |  |  |  |  |  | 7429 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{26} 6245$ | 613 | 6023 | 5912 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 581 | 603 |  |  | 667 |  |  |  |  |
| $8858$ | ${ }_{5}^{4} 58585$ | 288 | 258 | 24 |  | 223 | 12 |  | ${ }_{188}$ |  | $9 \cdot 4$ |  | S1606 |  |  | 5772 |  |  |  |  |  |
|  | $8671$ | 15 | 143 | 132 | 1206 | 108 | 09 | 085 | 07 |  |  | 954 | 9764 | 9986 | -207 | 0428 |  |  |  |  |  |
| $88$ |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{633}$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 393 | ${ }^{168}$ |  | 62 | 8 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{24} 8811$ | 468 | 456 | 44 | 4313 | 418 | 4064 | 393 | ${ }_{3815}^{498}$ |  |  | 2718 | 7006 | 7892 |  | 3785 |  | 478 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 227 |  |  |  |  |  |  |  | 411 | 135 |  |  |  |  |  |  |  |  |  |
|  |  | P108 | 9978 | 9888 | 971 | 9588 | 9458 | ${ }^{9328}$ |  |  |  |  | 6288 | ${ }_{648} 6$ | 6743 |  | 7237 | 48 |  |  |  |
|  |  |  |  |  |  |  |  |  | 8054 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | (1) 68807 | ${ }_{5529}^{565}$ |  |  |  |  |  | 5885 | 5735 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $15^{\prime}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.



TRAVERSE TABLES


# TRAVERSE TABLES． 

| $28^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $28^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{1}$ | $34^{\prime}$ | $35^{\prime}$ | 36 | 37 | $38^{\prime}$ | 39 | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | $34^{\prime}$ | $35^{\prime}$ | ${ }^{3}$ | 37 |  |  |  |
|  | 87 | 8787 | 8785 | 8784 | 8783 | 8781 | 8780 | 8778 | 8777 | 8776 | 477 | 4 | 4777 | 477 | 4782 | 4784 | 4787 | 99 | 4792 | 4795 |  |
|  | 7576 | 7572 | 757 |  | 7565 | 756 |  |  |  | 75 | 543 | 9548 | 9553 | 9559 | 9564 | 9569 | 9574 | 9579 | 9584 | 9589 |  |
|  | 6365 | 6360 | 6356 | 6352 | 6348 | 634 |  | 6335 | 63 | 63 | 4315 | 4322 | 4330 | 4338 | 4345 | 4353 | 4361 | 4368 | 4376 | 84 |  |
|  |  |  |  |  |  |  |  | 14 | 5108 |  |  | 9097 | 9107 | 9117 | 9127 | 913 | 9148 | 9158 | 9168 | 917 |  |
| 5 | 3941 | 3934 | 3927 | 20 | 3913 | 3906 | 3899 | 92 | 85 | 4.3878 | ．3858 | 387 | 3884 | 3896 | 390 | 392 | 3935 | 3947 | 3960 | 397 |  |
|  | 27 | 27 | 27 | 2704 | 2696 | 2687 | 2679 | 2671 | 2662 | 5.265 | $2 \cdot 8630$ | 86 | 86 | 86 | 8691 | 870 | 372 | 37 | 8752 | 8767 |  |
|  | 1517 | 1507 | 14 | 1488 | 1478 | 1469 | 145 |  |  |  |  |  | 3437 | 3455 | 3473 | 34 | 3508 | 3526 |  |  |  |
|  | 030 | 029 |  |  |  | 0250 | 0239 |  |  |  |  |  |  | 8234 | 8254 | 82 | 8295 | 8316 | 8336 | 8357 |  |
|  | 9094 |  |  |  |  |  |  |  |  |  | 214 | 2967 | 29 | 3013 | 3036 | 305 |  |  | 128 |  |  |
| 10 | 78 |  |  |  |  | 7812 |  |  |  | － |  |  |  | 7793 | 7818 |  |  | 7895 | 920 | 7946 | 析 |
| 11 | 667 | 6655 | 6639 | 6624 |  | 6593 |  |  |  | 9．6532 | ． 2487 | 2516 | 2544 | 2572 | 2600 | 2628 | 2656 | 2684 |  |  | 11 |
| 12 | 54 | 54 | 5425 |  |  |  |  |  |  |  | 7259 |  |  |  | 7382 | 74 | 7443 |  |  | 7535 | 12 |
| 13 | 4246 | 4228 | 4210 | 2 | 4174 |  |  | 4120 |  | $1{ }^{1}$ | 2031 |  |  | 2130 | 21 | 219 | 22 | 2263 |  |  | 13 |
| 1 | 30 |  |  |  |  |  | 2918 |  |  |  |  | 683 | 6874 | 69 | 6 | 6981 |  | 7053 |  | 7124 | 14 |
| 15 | 182 | 1802 | 178 | 1760 | 1739 | 1718 | 1697 | 1677 | 1656 | 13 | 157 | 16 | 165 | 168 | 172 | 176 | 180 | 1842 | 1880 | 1919 | 15 |
| 16 | 0611 | 0589 | 0566 | 054 | 0522 | 0500 | 0477 | 0455 | 0433 | 14.0410 | ． 6345 | 6386 | 6427 | 6468 | 65 | 65 | 6591 | 6632 | 6672 | 6713 | 6 |
|  | 93 |  |  |  |  |  |  |  |  |  |  |  |  | 1247 |  |  |  |  |  |  |  |
| 18 | 818 | 8162 | 8137 | 8112 | 80 | 62 | 803 | 8012 | 7987 | 15.796 | ． 588 | 59 | 5981 | 6027 | 6073 | 6119 | 6165 | 6210 | 6256 | 6302 | 18 |
| 19 | 697 |  |  |  |  |  |  |  |  | 16.67 | 0660 |  |  | 080 |  |  |  |  |  |  | 19 |
| 20 | 57 |  |  |  |  |  |  |  |  | $17 \cdot 5513$ |  | 5483 | 5534 | 5585 | 5636 | 5687 |  | 5789 |  |  | 20 |
| 21 | 4552 | 4522 |  |  |  |  |  | 434 | 4318 | 428 | 10．0203 | 0257 | 031 | 0364 | 0418 | 047 | 052 |  |  |  | 21 |
| 22 | 334 | 33 | 32 |  | 3217 |  | 315 | 312 |  | 19 | 10 |  |  | 51 |  |  | 5312 |  | 5425 |  | 22 |
| 23 | 212 | 20 |  |  |  |  | 1936 |  | 18 | 20 | 10 |  |  | 9923 | 9982 |  |  |  | 0217 | 275 | 23 |
| 24 | 09 | 08 | 0849 | 0816 | 0783 | 0749 | 0716 | 0682 | 06 | 21.0616 | 11.4 | 45 | 46 | 47 | 4763 | 48 | 48 | 4947 | 5009 | 5070 | 24 |
| 25 | 97 | 96 | 9635 |  |  | 9531 |  |  | 9426 | 21.9391 | 11 | 93 | 94 | 94 | 9545 |  | 9673 |  |  |  | 25 |
| 26 | 84 | 8456 | 8420 | 8384 | 8348 | 8312 |  |  |  | 22.8167 | 12.406 |  |  | 4261 |  |  | 4460 | 4526 | 4593 | 4659 | 26 |
|  |  |  |  |  |  |  |  |  |  |  | 12.8833 |  |  |  |  |  |  |  |  |  | 27 |
| 28 | 606 | 603 | 599 | 5952 | 5913 | 587 | 5835 | 579 | 575 | 24.5718 | $13 \cdot 3604$ | 36 | 3748 | 381 | 389 | 3962 | 4034 | 4105 | 4177 | 424 | 28 |
| 29 | 48 |  | 47 |  |  |  |  |  | 4534 | 25.4494 | 13. | 8450 | 852 | 8598 | 8672 |  |  | 8895 | 8969 | 9043 | 29 |
| 30 | 364 |  |  |  | 3478 | 3437 |  |  |  | 26．3269 | 14 | 3224 | 3301 | 3378 | 3454 | 35 | 3608 | 368 | 3761 | 83 | 30 |
| 31 | 243 |  |  |  |  |  |  |  |  | 27．204 | 14＇791 | 799 | 8078 | 815 | 823 | 831 | 839 | 847 |  |  | 31 |
| 32 | 122 | 11 | 1133 | 1088 | 1044 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 32 |
|  | －01 |  |  |  |  |  |  |  |  | $28^{\prime} 9596$ | 15.7462 |  |  | 771 |  |  |  |  | 8137 |  | 33 |
| 34 | 879 | 875 | 8703 | 56 | 8609 | 8562 | 8514 | 846 | 8419 | 29.8372 | $16^{2} 22$ | 2321 | 240 | 249 | 2582 | 2668 | 27 | 2842 | 2929 | 301 | 34 |
| 35 | 7586 | 753 | 7489 | 7440 | 7391 | 7343 | 7294 | 7245 | 7197 | $30 \cdot 71$ | $16 \cdot 70$ | 70 | 71 | 727 | 73 | 7 | 7542 | 7632 | 772 | 781 | 35 |
| 36 | 6374 | 6324 | 6274 | 6224 | 6174 | 612 |  |  |  | 31.5923 | $17 \cdot 1777$ |  |  |  |  |  |  |  |  |  | 36 |
|  | 516 |  |  |  |  |  |  |  | 4751 | 32.469 | $17 \cdot 6549$ |  |  | 683 |  |  |  |  |  |  |  |
| 38 | 395 | 3898 | 3845 | 3792 | 3739 | 368 | 363 |  | 3528 | 33 | 18.132 |  | 1515 | 161 |  |  |  |  |  |  | 38 |
| 39 | 273 |  |  |  | 2522 |  | 2413 |  | 2305 | 34．225 | $18 \cdot 6092$ | 619 | 62 | 639 |  |  |  |  |  |  | 39 |
| 40 | 1527 | 147 |  | 1360 |  |  |  | 1137 | 1082 |  | 19. | 096 | 106 | 117 | 127 | 1375 | 147 | 15 | 168 | 1783 | 40 |
| 41 | 031 | 0258 |  |  |  |  |  |  | 985 | 35.980 | 19．563 |  |  | 594 |  |  | 6264 |  |  |  | 41 |
| 42 | 910 | 9045 |  |  | 8870 |  | 875 | 8694 | 863 | 36.85 |  |  |  | 0729 |  |  |  |  |  | 1372 | 42 |
|  | 78 |  |  |  |  |  |  |  | 7413 | 37•73 | $20 \cdot 51$ |  |  | 5508 |  |  |  |  |  |  | 43 |
| 44 | 668 | 661 | 6557 |  |  | 637 | 6313 |  |  |  | 20.99 |  | 017 | 028 |  |  |  |  | 0849 |  | 44 |
| 45 | 546 | 540 | 5343 | 5280 |  |  | 5092 | 5030 | 4967 | 39 | $21 \cdot 4721$ | 48 | 4952 | 5066 | 5181 | 52 | 5411 | 5526 | 5641 | 575 | 45 |
| 46 | 4256 | 419 | 4128 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
|  | 30 |  |  |  |  |  | 265 |  |  | 41 | $22 \cdot 4265$ |  |  |  |  |  |  |  |  |  |  |
| 48 | 18 |  |  |  |  |  |  |  |  | 42 |  |  |  |  |  |  |  |  |  |  | 48 |
| 49 | 06 |  |  |  |  |  |  |  | 0075 |  | 23 | 393 |  | 4183 |  |  |  | 4684 | 4809 |  | 49 |
| 50 | 94 | 9339 | 9270 |  | 9131 | 906 | 8992 | 8922 | 8852 | 43.8782 | 23•85 |  | 883 | 896 | 90 | 921 | 935 | 947 | 960 | 972 | 50 |
| 51 | 81 |  |  |  |  |  |  |  |  |  | $24 \cdot 33$ |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  | 45 | $24 \cdot 81$ |  |  |  |  |  |  |  |  |  | 52 |
| 53 | 577 | 56 | 562 | 5552 | 547 | 540 | 533 | 525 | 5183 | 46 | $25^{2894}$ |  | 318 | 330 | 343 | 35 |  | 842 | 3977 |  | 53 |
| 5 | 45 | 44 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 | 33 |  | 3197 |  |  | 29 | 2891 | 2814 | 273 | 48.266 | 26.2437 | 2578 | 2719 |  |  |  | 3281 | 3421 |  | 3702 | 55 |
|  | 2138 |  |  |  |  |  |  |  |  |  | 26.7209 |  |  |  |  |  |  |  |  |  |  |
| 5 | 09 | 084 | 0767 | 0688 |  | 053 | 045 |  | 0291 | 50 | $27 \cdot 19$ |  | 22 | 24 |  |  |  |  |  |  | 57 |
| 58 | 97 |  |  |  |  |  |  |  |  |  | $27 \cdot 67$ |  |  |  |  |  |  |  |  |  | 58 |
| 59 |  |  |  |  |  |  |  |  |  | $51 \cdot 7763$ | 28 |  | 18 | 1976 |  | 2277 | 242 | 2579 | 73 | 288 | 59 |
| 60 | 729 | 7207 | 7124 | 7040 | 695 | 687 | 679 | 6706 | 6623 | 52.653 | $28^{\circ}$ |  | 660 | 675 | 690 | 7062 | 721 | 7368 | 7522 | 767 | 60 |
| 6 | 607 |  |  | 5824 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 36 |  |  | 3392 | 330 |  | 312 | 3042 | 295 | 55 | 30 | 077 | 093 | 109 | 125 | 14 | 15 | 1737 |  |  | 63 |
| 64 | 24 |  |  |  |  |  |  |  |  | 56 |  |  |  |  | 60 |  |  |  |  |  | 64 |
| 65 | 12 |  |  |  |  |  |  |  |  | 57．04 | 1 |  |  |  |  |  |  |  |  |  | 65 |
| 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
| 67 | 88 | 8714 |  | 85 | 8435 |  |  |  |  | 5879 | 31 |  | ＋039 | 02 |  |  | 0724 |  |  |  | 67 |
| 68 |  |  |  |  |  |  |  |  |  |  |  |  |  | 480 |  |  |  |  |  |  | 68 |
| 69 | 638 |  |  |  | 60 | 5904 | 5808 | 5712 |  | 60.55 | 32.92 | 94 | 959 | 976 | 99 | ＋12 | 02 | 047 | 0650 |  | 69 |
| 70 | 5172 | 5075 | 978 | 488 | 4783 | 458 | 4588 | 449 | 4393 | 61.4295 | 33．4011 | 419 | 436 | 454 | 472 | 490 | 5084 | 5263 |  | 562 | 70 |
|  | 39 | 3862 |  |  |  |  |  |  |  | 62＊3071 | 33＇878 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 35 |  |  | ， |  |  |  |  |  |  | 72 |
| 73 | 153 | 1435 | 13 | 123 | 11 | 1029 | 0928 | 0826 | 0724 | 64.06 | 34．832 | 8513 | 869 | 888 | 90 | 9259 | 9445 | 963 | 砣 | ＋0 | 73 |
| 74 | 1535 |  |  |  |  |  |  |  | ， | 64.93 |  | 2 | 4 | 仡 | 85 | ， | 4232 | 4， |  |  | 74 |
| 75 | 9113 |  |  |  |  |  | 8487 |  | 27 |  | 35 |  | 825 | 碞 | 86 | 882 | 901 | 21 |  |  | 75 |
| 76 | 7901 |  |  | 7584 |  | 7373 | 7267 |  |  |  |  |  |  |  |  | 36 | 3806 | 200 |  |  | 76 |
| 77 | 66 | 6582 | 647 | 63 | 626 | 615 | 60 | 510 | 5832 | $67 \cdot 572$ | 3674 |  |  |  |  |  | 8593 |  |  | 918 | 77 |
| 78 | 547 |  |  |  |  |  |  |  |  | $68^{\prime} 4501$ |  | 源 | 矿 | 78 |  | 3180 | 析 |  |  |  | 78 |
| 79 | 4266 | 4156 | 4046 | 3936 | 3826 | 3717 | 3607 | 3497 | 3386 | 69.3276 | 37．6955 | 7157 | 735 | 75 | 77 | 7965 | 816 | 836 | 8570 | 877 | 79 |
| 80 | 305 | 2943 | 2832 | 2720 |  | 24 | 2386 | 2275 | 2163 | 70.2052 | $38 \cdot 1727$ | 1932 | 213 | 23. | 254 | 274 | 295 | 315 | 336 | 356 | 80 |
| 81 | 184 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 81 |
| 82 | 063 | 0516 | 918 | 208 | 0174 | 8 | 87 | 9832 | 918 |  | $30 \cdot 6$ |  | 64 | 1487 |  | 710 | 731 | 757 | 7738 |  | 82 |
| 83 | 941 | 9303 | 918 | 907 | 8957 | 88 | 872 | 10 | 8495 | 72．837 | 39．604 | 625 | 646 | 66 | 689 | 7102 | 7314 | 752 | 773 |  | 83 |
| 84 |  |  |  |  |  |  |  |  | 272 |  | ． 081 | 228 | 12 | 45 | 167 | 1887 | 10 | 7316 | 538 |  | 84 |
| 85 | 6995 | 877 | 6758 | 6640 | 6522 | 6404 | 286 | 167 | 202 | ． | $40 \cdot 558$ |  | 602 | 623 | 645 | 667 | 688 | 710 |  |  | 85 |
|  | 5783 |  | 5544 | 542 | 5305 | 5185 | 5065 | 46 | 4826 | 75＊47 | 41.03 | 057 | 079 | 10 | 12 | 145 | 1675 | 1895 | ， | 233 | 86 |
| 87 | 4571 | 4450 | 4329 | 4208 | 4087 | 3966 | 3845 | 3724 | 360 | $76^{\circ} 348$ | 41.51 |  | 55 | 57 | 6017 | 62 | 6462 | 668 | 690 |  | 87 |
|  | 3551 | 3237 | 3115 | 2 |  |  | 2625 | 201 | 230 | $77 \cdot 225$ | 41.99 | ， 25 | 531 | 057 | ， | 124 | 249 | ， | 698 |  | 88 |
| 89 | 2147 | 2024 | 1900 | 1776 | 1653 | 152 | 1405 | 1281 | 1157 | 78.1033 | 42：4671 | 489 | 51 | 535 | 55 | 5808 | 6036 | 626 | 648 | 67 | 89 |
| 90 | 0935 | 0810 | O685 |  |  | 0310 | 0185 | ＋059 | 993 | 78．9808 | 42.9443 | 9673 | 990 | ， | 0363 | 059 | 082 | 105 | 128 | 1512 | 90 |
|  | 4 |  | 9471 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 92 | 8512 | 838 | 8256 | 812 |  | 7872 | 774 | 761 | 7488 | 80．7360 | $43^{\circ} 898$ | 9221 | 945 | 9691 | 9927 | 1161 | 0397 | 681 | 868 | 102 | 2 |
| 93 | 7300 |  | 70 | 56 |  | 54 | 6524 | 6395 | 6265 | 81．613 | 44．375 | 399 | 42 | 4471 | 4708 | 4946 | 5183 | 542 | 56 |  | 93 |
| 94 | 608 | 5958 | 58 | 56 |  | 5435 | 5304 |  | 5042 | 82．4911 | 44.529 | 877 | 9787 | 925 | 949 | 973 | 9975 | －210 | 548 | 069 | 94 |
| 95 | 487 | 4744 | 467 | 4480 | 434 | 4216 | 4084 | 952 | 3819 | 83.3687 | $45^{\prime} 3301$ | 3544 | 378 | 402 | 4272 | 4515 | 475 |  | 52 |  | 95 |
| 96 | 366 |  | 3398 | 3264 |  | 2997 | 86 | 2730 | 2596 | 84.2462 | $45 \cdot 8072$ | 83 | 85 | 8808 | 9054 | 9299 | 5544 | 789 | 03 | 028 | 96 |
| 97 | 2453 | 2318 | 2183 | 2048 |  | 1779 |  | 1508 | 1373 | 85 123 | $46 \cdot 284$ | 888 | 311 | 3588 | 3836 | 083 | 4331 | 4579 | 482 |  |  |
|  | 124 |  | 096 | 0832 | 0696 | 0560 | 042 | 0287 | 0150 | 86.001 | 46.761 | 786 | 81 |  |  | 8868 | 91 | 9368 | 9619 |  | 98 |
|  | －029 | 9892 | 9754 | 析 | 9479 | 9341 | 9203 | 9065 | 927 | 86.87 | $47 \cdot 2387$ | 2640 | 2893 | 314 | 3399 | 3652 | 3905 | 4158 | 441 | 466 | 99 |
| 100 | 8817 | 8678 | 8539 | 8400 | 8261 | 8122 | 7983 | 7844 | 7704 | 8775 | 47.7159 | 7414 | 7670 | 7926 | 8181 | 8436 | 8692 | 8947 | 920 | 析 | 100 |
|  | 30 | $29^{\prime}$ | $28^{\prime}$ | 27 | $26^{\prime}$ | 25 | 24 | $23^{\prime}$ | $22^{\prime}$ | $21^{\prime}$ | $30^{\prime}$ | $29^{\prime}$ | 28 | ＇27 | 26 | 25 | $24^{\prime}$ | ［ $23^{\prime}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | SINT |  |  |  |  |  |

TRAVERSE TABLES．

| $28^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $28^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $4{ }^{1}$ | $41^{\prime}$ | 42 | $43^{\prime}$ | $44^{\prime}$ | $45^{\prime}$ | 46 |  | $48^{\prime}$ |  | 40 |  | $42^{\prime}$ | $43^{3}$ | $44^{\prime}$ | $45^{\prime}$ |  | $47^{\prime}$ |  |  |  |
|  | $1{ }^{18774}$ | ${ }^{8773}$ | 8771 | 75 | 粏 | 876 | 8766 | 8764 |  |  |  | － | 4802 | 4805 | 4807 | 10 | 12 | 15 | 4818 | 820 |  |
|  | ${ }_{2}^{2}$ | 75 | 75 | 5 | 37 | 7535 | 7532 | 7529 | 7526 | 7523 | 594 | 9599 | 9604 | 9610 | 9615 | 20 | 25 | 30 |  |  |  |
|  | 6323 | 631 | 6314 | 63 | 6306 | 6302 | 6298 | 62 | 6289 | $2 \cdot 6285$ | 1.4391 | 4399 | 4407 | 4414 | 22 | 4430 | 4437 |  |  |  |  |
|  | 45097 | 509 | 5086 | 50 | 5075 | 5069 | 5063 | 5058 | 5052 | $3 \cdot 5047$ | ． 9189 | 9199 | 9209 | 9219 |  |  |  |  |  |  |  |
|  | 53871 | 3864 | 3857 | 285 | 383 | 383 | 382 | 3822 | 13815 | $4 \cdot 3808$ | 2．3986 | 399 | 401 | 402 | 40 | 4049 | 4062 | 4075 | 408 |  |  |
|  | 2646 | 2637 | ${ }^{2629}$ | 2620 | 2612 | 260 | 259 | 25 | ${ }^{2578}$ | $5 \cdot 2570$ | 2.8783 | 879 | ${ }^{88}$ |  | 4 | ${ }^{8859}$ | ${ }^{8875}$ |  | 8905 |  |  |
|  | 1420 | 1410 | 140 | 139 | 1381 | 13 | 13 | 13 | 13 | 6.133 | 3.3580 | 35 |  | 3634 |  |  |  |  |  |  |  |
|  | 88194 | 0183 | 0172 | 01 | 01 | 0138 |  |  |  | $7 \cdot 009$ | 3．837 | 83 | 841 | 8438 | 8459 | 847 | 850 | 85 | 85 |  |  |
|  |  | 895 | 3943 | 8931 |  |  |  |  |  |  |  |  |  | 32 | 326 | 3289 | 3312 | 333 | 3358 |  |  |
|  | 774 | 772 |  |  |  | 7673 | 7659 |  |  | 8.7617 | 47971 |  | 8022 | 8048 |  | 8099 |  | 8150 |  |  |  |
|  | 65 | 650 | 648 | 164 | 645 |  |  |  |  |  |  |  |  |  |  |  |  | 2965 |  |  | 11 |
|  |  | 52 | 52 | 52 | 52 |  | 5190 | 5174 | 5157 | 10.51 | 575 | 7596 | 7627 | 7657 | 7688 | 771 | 7749 | 778 |  |  | 12 |
|  | 4065 | 4047 | 40 | 40 |  | 3974 | 295 | 3938 | 3920 | 11.390 | 6.2363 | 2396 | 2429 | 2462 | 2495 | 252 | 2562 | 5 |  |  | 13 |
|  | ${ }^{4} 2840$ | 2820 | 28 | 27 | 2761 | 2742 | 2722 | 2703 | 2683 | 12.2663 | 6.7160 | 7196 | 7231 | 726 | 7303 | 733 | 7374 | 7410 | 74 | 748 | 4 |
|  | 51614 | 15 | 15 | 1551 | 1530 | 1509 | 148 | 146 | 1446 | 13.1425 | $7 \times 1957$ | 1995 | 203 | 2072 | 17 | 析 | 218 | 22 | 2 | 231 | 5 |
|  | 16 | 0366 | ${ }^{0343}$ | 0321 | 10299 | 0276 | 10254 | 0231 | 0209 | 14.018 | 7.6754 | 679 | 683 | 687 | 6917 | 6958 | 6999 |  |  | 7121 | 6 |
|  | 916 | 9139 | 9115 | 90 | 9067 | 9044 | 9020 | 8996 | 8972 | 14：89 | 8.1551 | 1595 | 16 | 168 | 25 | 1768 | 1811 | 1855 |  |  | 17 |
|  | 793 | 791 | 7886 | 78 | \％ | 757 | 76 | 77 | 7735 | $15 \cdot 77$ | 8.6348 | 6394 | 64 | 648 | 6532 | 6578 | 662 | 6670 | 67 | ， | 18 |
|  | 6711 | 6684 | 665 | 663 | 66 | 6578 |  | 6525 | 649 | 16 | 9.1145 | 119 |  | 12 | 1339 | 138 | 123 |  | 15 |  | 19 |
|  | 20.5485 | 545 | 54 | 5401 | 5373 | 5345 | 5317 | 5289 | 5261 | 17. | 9.5943 | 5994 | 6045 | 609 | 6147 | 16198 | 16249 | 1630 | ${ }_{63}$ | 6402 | 20 |
|  | 4259 | 42 | 420 | 417 |  |  |  |  |  | 18 3 | 10.07 |  |  |  |  |  |  |  |  |  |  |
|  | 3034 | 30 | 297 | 29 | 29 | 28 | 2849 | 2818 |  | 19.275 | 10.55 | 55 | 56 | 57 | 576 | 581 | 587 | 59 | 5 |  | 2 |
|  |  | 17 | 17 | 1711 |  |  |  | 15 | 1551 | $20 \cdot 15$ | 11.03 | 03 | 04 | 051 | 056 | 062 | 068 | 07 | 0803 |  |  |
|  | 240582 |  |  | 0482 | 0448 | 0414 | 0381 | 03 | 0314 |  |  | 51 | 52 | 5315 | 5376 | 543 | 549 |  |  |  |  |
|  | 9356 | 9321 | 9287 |  |  |  | 9147 | 9112 | 硡 | 21．9042 | 11.9928 | 9992 | ＋05 | ， | 0183 | 24 | 0311 | O3 | 0438 |  | 25 |
|  | 26131 | 80 | 8058 | 802 | 7985 |  | 791 | 7876 | 7840 | 22.7803 | $1{ }^{12.4725}$ | 4792 | 4858 | 4924 | ｜ 4991 | 505 | 5123 | 5190 | 5256 |  | 26 |
|  | 276905 | 686 | 682 | 6792 | 6754 | 67 | 6678 | 6641 | 6603 | 23 | 12.95 | 959 | 96 |  | 9798 | 986 | 993 |  |  |  | 27 |
|  | 5679 | 5640 | 56 | 556 | 55 | 5484 | 5444 | 05 | 53 | 24 | 13.4320 | 4391 | 44 | 4534 | 4605 | 4677 | 474 | 48 | 48 |  | 28 |
|  | 4453 | 4413 | 437 |  | 4291 | 4251 | 4210 | 4170 | 4129 | $25 \cdot 40$ | 13.9117 | 919 | 92 |  | 9413 | 948 | 95 |  |  |  |  |
|  | 3228 | 3186 | 314 | 310 | 3060 | 3018 | 2976 | 2934 | 2892 | 26．28 | 14 －3914 | 399 | 40 | 41 | 4220 | 429 | 437 | 4450 | 4526 |  | 30 |
| 31 | 2002 | 1959 | 1915 | ${ }^{1872}$ | 1829 | 1785 | 174 |  |  | 27 | 14：87 | 879 |  |  |  |  |  |  |  |  | 31 |
|  | 2.0776 | 0731 | 068 | 06 | 059 | 0553 | 0508 | 0463 | 04 | 28. | 15.35 | 359 |  |  | 383 | 39 |  |  |  |  | 32 |
|  | 955 | 950 | 9458 |  | 9366 | 93 | 927 | 922 | 91 | 28 | $15 \cdot 8$ | 839 | 847 |  |  | 872 | 8810 | 889 |  |  |  |
|  | 34 38 | 82 | 8230 | 8182 | 8135 |  | 8040 |  | 79 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 209 | 7050 | 7001 |  |  | 68 | 6805 | 6756 |  |  |  |  |  |  |  |  | 8435 | 8525 | 8614 |  | 5 |
|  | ${ }^{6} 5873$ | 58 | 5773 |  | 5672 | 5622 | 557 |  |  | 31.542 | 172 | 27 | 288 | ｜2972 | 3064 | 315 | 3248 | 340 | 3431 | 3523 | 36 |
|  |  |  |  |  |  | 4389 | 4337 | 4285 | 4233 | $32^{2} 4$ | $17 \cdot 7494$ | 758 |  |  |  |  | 8060 | 815 |  |  |  |
| 38 | 83422 | 336 | 33 | 3262 | 3209 | 3156 | 3103 |  | 2997 |  | 18.22 | 238 | 24 | 25 | 267 | 2776 | 2873 | 2970 |  |  | ${ }^{38}$ |
|  |  | 21 | 2087 |  |  |  |  |  |  |  |  |  | 72 | 73 |  | 758 | 768 | 778 | 78 |  |  |
| 40 | 00970 | 091 | 0858 | 0803 | 0747 | 0691 | 0635 | 0579 | 0523 | 35.0467 | $19 \cdot 1885$ | 1987 | 208 | 219 | 2293 | 239 | 249 | 259 |  |  | 40 |
| 41 | 9744 | ${ }^{9687}$ | 9630 | 9573 | 9515 | 9458 | 940 | 9343 | 9286 | 35．922 | $19 \cdot 6682$ | 1678 | 689 |  |  |  |  |  |  |  |  |
| $42$ | 28519 | 8460 | 8401 | 8343 | 8284 | 8225 | 81 | 8108 | 8049 | 36.79 | 20．1480 | 158 | 169 |  |  |  | 212 | 202 | 23 |  | 42 |
| 4 | 729 | 7233 | 717 | 7113 | 70 | 69 | 6932 | 6872 | 6812 | 37．6752 | 20.627 | 638 | 64 | 66 | 671 |  |  | 70 | 7 |  | 3 |
|  |  |  |  | 58 | 58 | 57 | 5698 | 563 | 557 |  | $21 \cdot 1$ |  |  |  | 152 |  |  | 185 |  |  |  |
| 45 | 54841 | 4779 | 4716 | 465 | 4590 | 4527 |  | 4401 | 43 | 39 | 21.5871 |  |  |  |  |  |  |  |  |  | 45 |
|  | 63616 | 35 | 3487 | 3423 | 3359 | 32 | 323 | 3166 | 3101 | 40．3037 | 22.0668 |  |  |  |  |  |  |  |  | 1724 | 46 |
|  |  | ${ }_{109}^{232}$ | 2259 | 2193 0963 | 2127 0896 | 20 | 19 | 1930 0694 | 1864 0627 | $41 \cdot 179$ 42050 |  | 55 |  |  |  |  |  | 630 | 642 |  |  |
| 49 |  |  |  |  |  |  | ${ }^{07528}$ |  |  |  |  |  |  |  |  |  |  |  |  |  | 8 |
| 50 | 08713 | 864 | 8573 | 8503 | 8433 | 8363 | 1293 | 8223 | 9390 | 4， $\begin{aligned} & 42 \cdot 9322 \\ & 43.8083\end{aligned}$ | 23．5959 |  | $\left\|\begin{array}{l} 531 \\ 1 \end{array}\right\|$ | $\left\lvert\, \begin{aligned} & 54: \\ & 02: \\ & 02 ; \end{aligned}\right.$ | $5360$ | $\begin{aligned} & 089 \\ & 0494 \\ & \hline \end{aligned}$ |  |  | $0059$ |  | 50 |
| 51 | 7487 | 7416 | ${ }^{7345}$ | 7273 | 7202 | 7131 |  | 6988 | 6916 | 44：6845 | 24.4654 | 4784 | 491 | 50 | 5174 | 530 |  |  |  |  |  |
| $52$ |  | 618 | 61 | 60 | 5971 | 58 | 5825 | 5752 | 5679 | $45 \cdot 56$ | 24.9451 | 9584 | 97 | 98 |  | ＋11 | 0247 | －37 |  |  |  |
| $53$ |  | 4961 | 4887 | 4813 | 4739 | 4665 | 4591 | 4517 | 4443 | $46^{\prime} 4368$ | 25.4248 | 438 | 451 | 46 | 47 | 492 | 505 | 519 | 53 |  | 53 |
| 54 |  | 37 | 3659 | 358 | 3508 | 343 | 3357 | 3281 | 320 | 47.313 | 25－9045 | 918 | 93 | 94 | 95 | 9734 | 987 | ＋00 |  |  | 54 |
| 55 |  |  | 2430 | 2354 | 2277 | 22 | 2123 | 2046 | 1969 | 48.189 | 26.38 | 39 | 41 | 4263 | 4404 | 45 | 468 | 482 | 4965 |  | 55 |
| 56 | 56 | 12 | 120 | 1124 | 1045 | 09 | 08 | 0810 | 0732 | 49.065 | $26 \cdot 863$ | 87 |  |  |  |  |  |  |  |  |  |
| 5 |  | ＋0 | 99 | 988 | 9814 | 97 | 96 | 9575 | 9495 | 49.94 | $27 \cdot 34$ | 35 | 37 | 38 |  | 41 |  | 4454 | 46 |  | 57 |
| 59 |  |  |  |  | 8583 | 8502 | 8420 | 83 | 8258 |  |  | 83 | 85 | 867 |  | 897 | 9121 | 926 | 9417 |  | 58 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3783 | 3934 | 4084 | 4235 |  | 59 |
| 60 | 0645 | 63 | 6288 | 6204 | 6120 | 6036 | 5952 |  | 578 | 52.570 | 28.7828 | 798 | 8134 | ${ }^{2} 8$ | 8440 | 859 | 874 | 8899 | 9052 | 9205 | 60 |
| 61 | 52 | $514$ |  | 4974 |  |  |  | 4633 | 4547 | 53.4 |  | 278 | 293 | 309 | 3248 | 340 | 3559 | 3714 | 3870 | 4025 | 61 |
| 62 | 400 |  |  | 3744 | 3657 | 357 | 34 | 3397 | 3310 | 54：3223 | 29.7422 | 75 |  |  |  |  |  | 29 | 8687 |  |  |
| 63 | 277 | 26 | 26 | 2514 | 2426 | 2338 | 2250 | 2161 | 2073 | 55．1985 | 30.2219 | 238 | 254 | 270 | 286 |  | 318 | 320 |  |  | 63 |
| 64 |  | 1463 | 1374 | 128 | 11 | 1105 | 1016 |  | 0836 | 56.0747 | $30 \cdot 7016$ | 718 | 734 | 75 | 76 | 78 |  | 8150 | 832 |  | 64 |
| 65 | 032 | 023 | 0145 | P054 | 9963 | 9872 | 9781 | 9690 | 9599 | 56．9508 | $31 / 1814$ | 1979 | 214 | 231 | 247 | 2 | 280 | 2974 | 31 |  | 碞 |
| 66 | 9101 | 9009 | 8916 | ${ }^{8824}$ | ${ }^{8732}$ | 8640 | ${ }^{8547}$ | 8455 | ${ }^{8362}$ | 57．8270 | 31.661 | 6779 | 694 | 711 | 72 | 74 | 7621 |  |  |  |  |
| $67$ |  | 77 |  | 75 | 75 | 74 | 7313 | 7219 | 72 | 58．7032 | 32：1408 | 1579 | 175 |  | 20 | 22 | 3 | 2604 | 277 |  | 67 |
| 68 68 |  | 65 | 6459 |  | 62 | 617 | 607 | 59 | 5889 | 59．57 | 32.6 | 637 | 655 | 6725 | 689 | 707 |  |  | 759 |  | 68 |
| 70 | 41 |  |  |  | 5038 3807 | 3709 | 4845 | 4748 | 4652 |  |  |  | 13 |  |  | 189 |  | 223 | 2410 |  | 69 |
| 71 |  |  |  |  | 257 | 2476 | 2377 |  |  |  |  |  |  | 11 |  |  |  | 180 |  |  | 71 |
| 72 | 174 | 16 | 15 | 14 | 1344 | 1243 | 1142 | 1042 | 0941 |  | 34 |  |  |  |  |  |  |  |  |  |  |
| 73 | 3052 | 04 | 03 | 02 | 0113 | ＋0 | 9908 |  | 9704 | 63.9 | 35.0191 | 0377 | 5 | 525 | 57 | 112 | 位 | 1494 |  |  | 73 |
| 74 |  |  |  |  |  |  |  | ． | 8467 | $64 \cdot 8363$ | 35＇4988 | 517 | 536 | 555 | 57 | 59 | 6 |  |  |  | 74 |
| 75 | 8 | 7964 | 7860 | 7755 | 7650 | 7545 | 7440 | 7335 | 7230 | $65 \cdot 7125$ | 35．9785 | 9976 | ＋168 | 0359 | 05 | 07 | 09 | 1124 | 1315 | 1506 | 75 |
| 76 | ${ }^{6843}$ | ${ }^{6737}$ | 6631 | 6525 | ${ }^{6419}$ | ${ }^{6312}$ | 6206 | 6100 | 5993 | 66．5887 | $3{ }^{36 \cdot 4582}$ | 4776 | 4970 | 5164 | 53 | 55 | 5745 |  | 6133 |  | $\frac{76}{76}$ |
| 77 | 561 | 55 | 541 | 529 | 5187 | 50 | 4772 | 4864 | 4756 | 67.4648 | 36．93 | 9576 | 9772 | 99 | 1 | 03 | 0558 | 0754 |  |  | 77 |
| 78 | 439 | 42 | 417 | 406 | 3956 | 3847 | 3738 | 362 | 351 | 68.3 | 37 | 437 | 45 | 477 | 49 | 51 | 538 |  |  |  | 78 |
| 80 | 1940 | 18 | 1717 | 1605 | 1493 | 1381 | ${ }_{1269}^{2504}$ |  |  |  |  |  |  |  |  |  |  |  |  |  | 79 |
|  | 071 | 06 | 04 | 037 | 026 | 01 | 1.035 |  |  |  | 38：3770 | 877 |  |  |  | 49 | 489 | 5199 | 5403 |  | 80 |
| $82$ |  | 937 | 9260 | 91 | 9031 | 8916 | 8801 | 868 | 8571 | 71.84 | 39 | 3574 | ${ }_{3783} 8$ | 399 | 420 | 441 | 462 |  |  |  | ${ }_{82}^{81}$ |
| 83 | 32 | 81 | 80 | 79 | 77 | 76 | 7567 | 745 | 7335 |  |  |  |  |  |  | 921 |  |  | 985 |  | 83 |
| 84 |  |  |  |  |  |  | 6333 |  |  |  |  |  |  |  |  |  | 42 |  | 4673 |  |  |
| 8 | 812 |  |  | 545 | 5337 | 5218 | 5 | 过 | 4861 | 74：474 | 40.7756 | 7973 | 8190 | 8407 | 8624 | 884 | 9057 | 9274 | 949 | 9707 | 85 |
| 86 | 4586 | 446 | 43 | 422 | 410 | 3 | 38 | 3744 | 3624 | 75：35 | 41.25 | 2773 | 2992 | 3212 | 3431 | 365 | 3870 | 408 | 430 |  | 86 |
| 87 | 336 | 323 | 3117 | 17 | 2874 | 27 | 26 | 2509 | 2387 | 76 | 4 | 7572 | 7794 | 8016 | 8238 | 84 | 86 | 890 | 912 |  | 87 |
| 88 | 81234 | 2012 |  | 17 | 43 | 15 | 139 | 1273 | 1150 | 7711027 | 42.2148 | 2372 | 2597 | 2821 | 304 | 327 | 349 | 371 | 39 |  |  |
| 89 |  |  |  | 0536 |  | －287 | 0162 | －038 |  | 77．9788 | 42.6945 | 7172 | 7399 | 7626 | 7853 | 308 | 830 | 853 |  |  | 89 |
| 90 | 9683 | 9557 | 9432 | 9306 | 9180 | 9054 | 8928 | 8802 | 8676 | 78.8550 | $43 \cdot 1742$ | 1971 | 2201 | 2431 | 2660 | 289 | 3119 | 334 | 357 |  | 90 |
| 91 | 8457 | ${ }^{8330}$ | 82 | 80 | 7949 | 78 | 7694 | 源 | 439 | 79.7312 | 43.6539 | ｜6771 | 7003 | 7236 | 746 | 770 | 793 | 816 |  |  |  |
| 92 | 723 | 7103 |  | 684 | \％17 | 6589 | 64 | 6331 | 6202 | 80.6073 | 44：1336 | 1571 | 1806 | 2040 | 227 | 25 | 274 | 297 | 321 |  |  |
| 93 |  | 587 |  |  | 5486 4255 | ${ }^{5356} 4123$ | 52 | 5096 3860 | 495 | 81．4835 | 44.61 | 637 | 66 |  |  |  | 7557 | 7794 | 803 |  |  |
| 94 | $4{ }^{45}$ | ${ }_{3422}^{4649}$ | 3289 | ${ }_{315}^{438}$ | ${ }_{3023}^{4255}$ | 48 | 2757 | ${ }_{262}^{386}$ | 2498 | 82：3597 | 45．0930 | 1170 | 1410 | 645 |  | 6539 |  | 2609 |  |  |  |
| 96 | 232 | 219 | 2060 | 1926 | 179 | 16 | 15 | 1389 | 1254 | 84.112 | $46^{\circ} 05$ |  |  |  |  |  |  |  |  |  |  |
| $9$ | 110 | 0967 |  |  | 0561 |  | 02 | 0153 | ＋017 | 84：988 | 46．532 |  | 5817 | 6064 | 63 | 6559 |  |  |  |  |  |
| 98 |  | 974 |  |  |  |  |  | 8918 | \％ |  |  |  | 0619 |  |  |  |  |  |  |  |  |
|  | 8851 | 8513 | 8375 | 8236 | 8098 |  | 7821 | 7682 | 7544 | ${ }^{867405}$ |  |  | 5421 |  | 59 | 6179 |  |  |  |  |  |
|  | $\frac{742}{20}$ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | 硣 | 13＇ | $12^{\prime}$ | 878167 |  |  |  |  | 073 | 988 | $\frac{1244}{14^{\prime}}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $28^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $28^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | 52 | $3^{\prime}$ | 54 | 65＇ | 56 | 57 | 58 | 69 | 50 | 51 | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $5^{\prime}$ | $56^{\prime}$ | 67 | 58＇ | $\square^{\prime}$ |  |
|  | 876 | 87 | 8757 | 8756 | 8755 | 8753 | 8752 | 8750 | 8749 | 748 | 882 | 4825 | 4828 | 4830 | 4833 | 4835 | 4838 | 4840 | 4843 | 4846 |  |
|  | 752 | 751 | 751 | 75 | 75 | 750 | 75 |  |  | 17495 | 645 | 9650 | 9655 |  |  | 9671 | 9676 | 9681 | 86 | 9691 |  |
|  | 6281 | 627 | 627 |  | 62 | 62 | 525 | 625 | 624 | 2.624 | 4468 | 4476 | 4483 | 44 | 449 | 4506 | 4514 | 4521 | 4529 | 45 |  |
|  | 5041 | 5035 | 5030 | 5024 | 19 | 5013 |  | 500 |  |  |  | 9301 | 9311 | 932 | ¢3 | 934 | 935 | 362 | 9372 | 9382 |  |
| 5 | 3801 | 3794 | 3787 | 3780 | 3773 | 376 | 3759 | 375 | 374 | 4.3738 | ．4113 | 4126 | 4139 | 4151 | 416 | 4177 | 419 | 4202 | 4215 | 22 |  |
| 6 | 2562 | 2553 | 2545 | 2536 | 2528 | 251 | 25 | 25 | 24 | 5.2486 | 2.8936 | 8951 | 8966 | 8982 | 8997 | 9012 | 9027 | 43 | 58 | 9073 |  |
|  | 132 |  |  |  |  | 1273 |  |  |  |  |  | 3776 | 3794 | 3812 |  | 3848 |  |  | 1 | 919 |  |
|  | 0082 | 007 | 0060 | 0048 | 00 | 0026 | 0015 | －003 | 9992 | 6.998 | ＇8581 | 8601 | 8622 | 8642 | 8663 | 86 | 8703 | 24 | 44 | 3764 |  |
|  | 8842 |  |  |  |  |  |  |  |  |  |  | 3427 | 3450 | 3472 | 34 | 3518 | 351 | 64 | 87 |  |  |
| 10 | 760 | 7589 | 7575 |  |  |  |  |  |  |  |  |  | 277 |  | 8328 | 835 | 8379 | 05 | 430 |  | 0 |
| 11 | 636 | 63 | 6332 | 6317 | 6301 | 6286 | 6270 |  |  | ${ }^{9} \cdot 622$ | $5 \cdot 304$ | 3077 | 3105 | 133 | 3161 | 3189 | 3217 | 3245 | 273 |  |  |
| 12 | 512 | 51 |  | 50 | 5056 | 50 | 5 |  |  | 10.49 |  | 7902 |  |  |  | 8024 |  |  |  |  | 12 |
| 13 | 388 |  |  |  |  | 37 |  |  |  | 11 | 2694 | 2727 | 2760 |  | 28 | 2860 | 2893 |  | 2959 |  | 13 |
| 14 | 264 | 262 | 2604 | 25 | 2565 | 2545 | 25 | 2506 | 2486 |  | 6.7517 | 75 | 7588 | 7624 | 7660 | 7695 | 7731 | 7766 | 7802 | 7838 | 14 |
| 15 | 140 | 1 |  | 1341 | 1320 | 1299 | 1277 |  | 1235 | $13 \cdot 121$ | 7.2340 | 23 | 2416 | 2454 | 24 | 25 | 2569 | 2607 | 2645 |  | 15 |
| 16 | 01 | 0142 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 17 | 892 |  |  |  |  |  |  |  |  |  |  |  | 2071 |  |  |  |  |  |  |  |  |
| 18 | 768 | 76 | 7634 | 7609 | 75 | 7558 | 753 | 7508 | 7482 | 15. |  | 683 |  | 6945 |  | 7037 | 7082 | 7128 | 7174 | 2 | 18 |
| 19 | 644 |  |  |  |  | 6312 | 628 |  |  | 16 |  | 1678 | 172 | 177 | 1824 |  | 1920 |  | 2017 |  |  |
| 20 | 5205 | 5177 | 514 | 5121 | 5093 | 506 | 5037 | 5009 | 4980 | 17－495 | 9.6453 | 6504 | 6555 | 6606 | 6656 | 67 | 67 | 6809 | 6860 | 691 | 20 |
| 21 | 39 | 3936 | 3907 | 3877 | 3848 | 3818 | 3788 | 3759 | 3729 | 18.3700 | $10^{\circ}$ | 329 | 1382 | 1436 | 148 | 1543 | 15 | 1650 | 703 | 75 | 21 |
| 22 | 27 |  |  |  |  |  |  |  |  | 19.24 | $10 \cdot 6098$ |  | 621 |  |  |  |  |  |  |  | 2 |
| 23 | 148 | 14 | 1421 |  |  | 1324 |  |  |  | 20.11 |  |  | 1038 | 109 |  |  |  |  |  |  |  |
| 24 | 02 | 02 | 017 | 0145 | 011 |  |  |  |  | 20.99 | 11.57 | 580 |  | 59 |  |  | 6110 | 6171 | 6232 |  | 24 |
| 25 |  |  |  |  |  |  |  |  | 8725 | 21 | 12.0566 |  | 0693 | 07 |  |  | 0948 | 1012 | 1075 | 13 | 25 |
| 26 | 77 |  |  |  |  |  |  |  |  |  |  |  | 52 |  |  | 5720 |  |  |  |  | 26 |
| 27 | 652 | 64 | 645 | 6413 | 6375 | 633 | 629 |  | 622 |  | 13 |  | 034 | 04 | 0486 | 0555 |  | 0692 | 0761 |  | 27 |
| 28 | 528 |  |  |  |  |  |  |  |  | $24 \times 49$ |  |  | 517 | 52 |  |  |  |  |  |  | 28 |
| 29 | 404 | 400 |  |  |  |  |  |  |  |  |  |  | ． 004 |  |  | 02 | 030 | 037 | 0447 |  | 29 |
| 30 | 28 | 2766 | 27 | 268 | 2639 | 2597 | 2555 | 251 | 2470 | 26 | 14. | 47 | 483 | 4908 | 498 | 506 | 513 | 521 | 529 | 536 | 30 |
| 31 | 1568 | 1525 | 1481 | 1438 | 1394 | 1350 | 1307 | 126 | 1219 | 27 | 14 | 9581 | 966 | 973 | 9818 | 9896 | 9975 | ＋054 | 0133 | 021 | 31 |
|  |  |  |  |  |  | 0104 |  |  |  |  |  | 4406 | 4487 |  |  |  | 4813 |  |  |  | 2 |
| 33 | 908 | 90 | 8996 | 8950 | 8903 | 885 | 8810 | 876 | 8718 | $28 \cdot 867$ |  | 92 | 93 |  | 94 |  | 965 | 973 | 981 | 9903 | 33 |
|  |  |  |  |  |  |  |  |  |  |  | $16^{\circ} 3$ | 40 | 414 |  | 43 |  |  | 4576 | 4662 |  | 34 |
| 35 |  |  |  |  |  |  |  |  |  |  | 16 |  |  |  |  |  |  |  |  |  | 35 |
| 36 | 536 | 5319 | 5268 |  |  | 5117 |  |  |  | 31．491 | 17．361 | 3707 |  |  |  |  |  |  |  |  | 36 |
| 3 | 413 | 40 | 4026 | 3974 |  | 387 |  |  |  |  |  |  |  |  | 881 |  |  |  |  |  | 37 |
|  |  |  |  |  | 2677 | 2623 |  |  |  | $33 \cdot 240$ | 18.3260 | 3357 | 3454 |  |  |  | 3841 | 3938 |  | 4131 | 38 |
| 39 | 16 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 0411 | 035 | 0298 | 0242 | 0186 | 013 |  | －017 | 996 | 34. | 19. | 300 | 310 |  |  | 3415 | 351 | 361 | 372 | 38 | 40 |
| 41 | 9171 | 9113 | 9056 |  |  |  |  | 8767 | 8710 | $35 \cdot 8652$ | 19 | 7832 | 7937 | 8041 | 8146 | 8250 | 8355 | 8459 |  |  | 41 |
| 42 | 793 | 787 | 7813 |  |  |  |  |  |  |  | $20 \cdot 25$ |  |  |  |  |  |  |  |  |  | 4 |
| 43 | 66 | 663 | 6571 | 6510 | 6450 | 6389 | 632 | 626 |  | 37－614 | 20 |  |  |  |  |  |  | 8140 | 824 |  | 43 |
|  | 54 |  |  |  |  |  |  |  | 4957 | 38.489 | ${ }^{1} \cdot$ |  | 2420 | 2532 |  | 275 |  | 2980 | 3092 |  | 44 |
| 45 | 42 |  |  | 4022 |  |  | 3832 | 37 |  | 39．3642 | 2 | 713 |  |  |  |  |  | 7821 |  |  | 45 |
| 46 | 29 | 290 |  | 277 |  |  |  |  |  |  | 22 |  | 207 |  |  |  |  |  |  |  | 46 |
| 47 | 17 |  |  | 1534 | 1468 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 | 04 | 042 |  |  | 0223 |  |  |  |  | 41.98 | 23 |  | 173 |  |  |  |  |  |  |  |  |
| 49 | 92 |  |  |  |  |  |  |  |  |  |  | 6434 | 655 |  |  |  |  |  |  |  | 49 |
| 50 | 8013 | 7943 | 7873 | 7803 | 7732 | 7662 | 7592 | 7521 | 7451 | 43 | 24. | 1259 | 138 | 15 | 16 | 17 | 189 | 2023 | 21 | 2278 | 5 |
|  | 6773 | 670 |  |  |  |  |  |  |  | $44 \cdot 61$ | 24．5954 |  |  |  |  |  |  |  |  |  |  |
| 5 | 55 | 5461 | 53 | 5315 | 52 | 516 |  |  |  | 45 | 25.07 |  | 1042 |  |  |  |  |  |  |  | 52 |
|  | 429 | 42 |  | 407 |  |  |  |  |  | 46 |  |  | 587 |  |  |  |  |  |  |  | 53 |
| 5 | 30 | 29 |  | 2827 | 27 |  |  |  |  | 47 | 56 |  |  |  |  |  |  | 1385 | 52 |  | 54 |
| 55 | 181 | 173 |  |  | 1505 |  |  |  |  |  | 26.52 | 5385 | 552 |  | 5805 |  |  | 6225 | 636 |  | 55 |
| 5 | 057 |  |  |  |  |  |  |  |  |  |  | 02 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 518 |  |  |  |  |  |  |  |  |
| 5 | 8095 | 80 | 7932 | 7851 | 7769 | 7688 | 7606 |  |  | $50 \cdot 7361$ | 27 | 986 | －008 | 01 | 03 | 04 | 559 | 074 | 089 |  | 58 |
| 5 |  |  |  |  |  |  |  |  |  |  |  | 468 | 483 |  |  | 528 | 5437 |  |  |  |  |
| 60 | 56 | 553 |  | 5363 | 5279 | 5194 | 5110 | 5026 | 4941 | 5 | 28 | 951 | 9664 | 9817 |  | 122 | 027 | 0428 | 0580 | 073 | 60 |
|  | 43 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 31 | 30 | 29 | 2875 | 2788 | 27 |  | 2526 |  | 23 | 29 |  |  |  |  |  |  |  |  | 04 | 62 |
|  |  |  |  |  |  |  |  |  |  | ．10 |  | 398 | 414 | 43 |  |  |  | 494 |  |  |  |
| 64 | 065 | 05 |  | 0387 |  |  |  |  |  | 55.98 | $30 \cdot 86$ | 881 | 897 | 91 |  | 94 | 962 | 97 | 995 | 11 | 64 |
| 65 | 94 | 932 | 9235 | 9143 | 9052 | 89 |  | 8778 |  | 56．859 | 31 |  |  |  |  | 4299 | 4465 |  | 479 |  | 65 |
|  | 81 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 569 | 56 | 55 | 54 | 5316 | 52 | 512 | 5029 | 493 | 59.48 | $32 \cdot 7$ | 81 | 828 | 84 |  | 881 |  |  | 砣 |  | 68 |
| 69 |  |  |  |  |  |  |  |  |  | $60 \cdot 35$ |  |  | 311 |  |  | 3641 | 3816 |  |  |  |  |
| 70 | 32 | 31 | 3022 | 2924 | 2825 | 2727 |  |  |  | $61 \cdot 2332$ | 33.75 | 776 | 析 |  | －2 | 676 | 865 | 883 | 01 | 918 | 70 |
| 71 | 197 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 硣 | 385 |  |  |
| 7 | 073 | 063 | 05 | 0436 | 0334 | 023 |  |  | 992 |  |  |  |  |  |  |  |  | 8513 |  |  | 72 |
|  | 949 |  |  |  |  |  |  |  |  | 957 |  | 228 | 2282 |  |  | 817 |  |  |  |  | 73 |
| 74 | 825 | 815 | 80 |  | 784 | 7740 | 763 | 753 | 74 | $64 \cdot 732$ | 35.687 | 7063 | 725 | 74.0 | 76 | 78 | 80 | 8194 | 83 | 857 | 74 |
| 75 | 7020 |  | 6809 | 6704 | 6598 | 6493 |  |  |  |  |  | 1889 | 208 | 227 |  | 2653 | 28 |  | 3226 |  | 75 |
| 76 | 578 | 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
|  | 452 | 443 |  |  |  |  |  |  |  |  |  |  |  | 103 |  | 232 |  | 27 | 291 |  | 77 |
| 78 | 330 | 31 | 30 | 2972 | 28 | 2753 | 26 | 2533 | 2423 | 68.23 | $37 \cdot 61$ | 63 | 656 | 676 | 6960 | 7159 | 735 | 556 | 77 |  | 78 |
| 79 | 2301 |  |  |  |  |  |  | 834 | ， |  |  | 189 | 1391 | 159 | 793 | （8） | 219 | 2396 | 7935 |  |  |
| 80 | 0821 | 0709 | 0596 | 84 | 0372 | 025 | 014 | ．034 | 9921 | 69.9809 | 38.581 | 6015 | 621 | 642 | 662 | 683 | 703 | 723 | 744 | 764 | 30 |
|  | 958 | 9468 | 9354 | 9240 | 9126 | 90 | 8898 | 8784 | 867 | 70 |  | 084 | 1046 | 125 |  |  | 1871 | 2077 | 228 | 2490 |  |
| 82 | 8342 | 82 |  | 7996 | 7881 | 776 | 7650 | 7535 | 7419 |  |  | 56 | 587 | O83 | 29 |  | 1 | 6918 | ， |  |  |
| 83 | 7102 | 6985 | 68 | 6752 | 6836 | 6519 | 6402 |  | 6168 |  | 40.027 | 0490 | 0702 | 0913 | 1124 | 133 | 154 | 1758 | 1970 | 218 | 83 |
| 84 | 586 | 5744 | 56 | 5508 | 5390 | 5272 | 5154 | 5036 | 491 | 73.479 | 40.5 | 5315 | 552 | 574 | 5957 | 61 | 6385 | 6599 | 68 | 702 | 84 |
| 85 | 46 |  |  |  |  |  |  |  |  |  | ， |  | 035 |  |  | ， |  |  |  |  | 85 |
| 86 | 3383 | 226 |  |  |  |  |  |  |  |  |  |  | ， | 5 |  |  |  | 220 |  |  | 86 |
| 87 | 214 | 202 | 1899 | 1776 | 1654 | 1532 | 1409 | 1287 | 1164 | 76．10 | 41.956 | 979 | －013 | 023 | 045 | 067 | 089 | 1120 | 134 | 156 | 87 |
| 88 | 0903 | 80 |  | 2 | 析 | 285 |  | －037 | 9913 |  |  | 4616 | 4840 | 506 | 528 | 5513 | 5737 | 596 | 618 | 640 | 88 |
| 89 | 966 | 9538 | 13 | 928 | 9163 | 903 | 8913 | 8788 | 8662 | 77•8537 | 42.9214 | 944 | 966 | 989 | ＋12 | 034 | 057 | 0801 | 1028 | 125 | 89 |
| 90 | 84 | 8297 | 8171 | 8045 | 7918 | 779 | 7665 | 7538 | 7411 | 78.7285 | $43 \cdot 4037$ | 426 | 449 | 472 | 495 | 51 | 54 | 5642 | 58 | 610 | 90 |
| 91 | 7184 | 析 |  |  | 6573 | 6545 |  | 6289 | 6160 | 79．603 | 43.88 | 9092 | 9323 | 955 |  | 10 | 0250 | 5483 |  |  |  |
| 92 | 594 | 581 | 443 | 5557 | 5427 | 525 | 169 | 5039 | 仡 |  | $44^{4} \cdot 368$ | 3917 | 415 | 438 | 46 | 485 | S0 | 532 | 555 | 061 |  |
| 93 | 470 | 457 | 443 | 4313 | 4182 | 405 | 3920 | 3790 | 3658 | 813527 | 44.850 | 8742 | 897 | 92 | 94 | 968 | 99 | 163 | 0400 | 063 |  |
| 94 | 3465 | 矿 | ， |  | 2937 | 2 | 2672 | 2540 | 2408 | 82.2275 |  | 3567 | 3807 | 4046 | 4285 | 4525 | 4764 | 5003 | 243 | 548 | 94 |
| 95 | 2225 | 2092 | 1958 | 1825 | 1691 | 1558 | 142 | 1290 |  | 83•1023 | 4 | 8392 | 63 | 887 | 析 |  | 9602 | 88 | －086 | 032 | 95 |
|  | 098 | 0850 | 16 | 81 | 0446 | 031 | 0176 | 104 |  | $83 \cdot 9770$ | $46 \cdot 297$ | 3217 | 3462 | 370 | 395 | 4196 | 4440 | 468 | 992 | 517 | 96 |
|  | 9746 | 析 | 73 | 9337 |  | 9064 | 3928 | 8791 | 865 | 84－85 | $46 \cdot 779$ | 8043 | 8290 | 853 |  | 903 | 9278 | 952 | 9772 | ． 01 | 97 |
|  | 85 | 83 | 8231 | 8093 | 7955 | 78 | 7680 | 52 |  | 85.265 | 472618 | 603 |  | 3367 | 析 | 8860 | 9954 | 4365 | 4615 | 486 | 98 |
|  | 726 | 27 | 88 | 849 | 67 | 657 | 643 | 629 | 6153 | 86．6013 | $47 \cdot 7441$ | 7693 | 7945 | 819 | 8450 | 8702 | 8954 | 9206 | 9458 | 710 | 99 |
| 100 | 6026 | ${ }^{1}$ | 5746 | 5605 | 5465 | ${ }^{\prime}$ | 5183 | 5043 | 4902 | 87－476 | $48 \cdot 2263$ | 18 | ${ }^{1}$ | － | 3282 | ${ }^{\prime}$ | ＋ | 3＇ | 4301 | 555 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | \％ | ${ }^{\prime}$ |  | T |  | \％ |  |  | $6^{\prime}$ | ＇ |  |  |  |  |  |
| $61^{\circ}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

| 29 |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\circ}$ | 41 | 42＇ | $4{ }^{\prime}$ | $44^{1}$ | 45 | 46 | 47 | 48 | $49^{\prime}$ | $40^{\prime}$ | $41^{\prime}$ | $42^{\prime}$ | $43^{\prime}$ | $44^{\text { }}$ | 45＇ | 46＇ |  |  |  |  |
|  | 868 | ${ }^{868}$ | 86 | 8685 | 86 | 8682 | 8681 | 8679 | 8678 | ． 8676 | 4950 | 4952 | 4955 | 4957 | 4960 | 4962 | 4965 | 4967 |  |  |  |
|  | 7378 | 7376 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 6068 | 6063 | 60 | 60 |  |  |  |  |  |  |  |  |  | 7 | 4879 | ${ }_{9849}^{4886}$ | $41$ | $4902$ | 4909 |  |  |
|  | 4757 | 4751 | 4745 |  |  |  | 4722 3403 |  |  | $4 \cdot 3$ | 2.4 |  | 4773 | ${ }^{9828} 4$ | 9839 4798 | 984 | ， | 4836 |  |  |  |
|  | 2135 | 2127 | 2118 | 2109 | 2101 | 2092 | 2083 | 2075 | 206 | $5 \cdot 205$ |  |  |  | 9743 | 9758 |  | 88 |  | 8 | 983 |  |
|  | 0824 | 0814 | 0804 |  | 0784 | 0774 | 0764 | 0754 | 07 | 6.073 |  | 4664 | 4682 | 4700 | 4717 | 4735 | 4753 | 4771 | 88 |  |  |
|  | 9514 | 9502 | 9491 |  |  | 94 | 9444 | 9433 | 94 | 6.9410 | 3．955 | 96 | 96 | 57 | 9677 | 9697 | 9718 | 9738 | 9758 |  |  |
|  | 3203 | 8190 | 8177 | 8164 |  |  |  |  |  |  | $4 \cdot 45$ | 456 | 45 | 4614 | 4637 | 4659 | 4682 |  |  |  |  |
| 1 | 6892 | 6878 | 6863 |  | 6834 | 6820 | 6805 | 67 | 6777 | 8．6762 | 4.9495 | 952 | 95 | 957 |  | 9622 |  |  |  |  |  |
| 11 | 5581 | 5565 |  |  |  |  | 54 | 547 | 5654 | ． 543 | 5.4445 | 44 | 45 | 452 | 455 | 4584 | 4612 | 4639 |  |  | 11 |
| 12 | 427 | 4253 | 42 | 42 | 42 | 418 | 41 | 41 | 413 | $10^{\text {P }} 41$ |  | 942 |  |  |  | 9546 |  |  |  |  |  |
| 13 | 2960 | 2941 | 2922 | 29 | 2885 |  | 284 |  |  | 11 |  | 437 | 44 | 4442 | 4475 | 458 | 4541 | 457 |  |  | 13 |
|  |  |  |  |  |  |  |  |  | 1487 | 12 |  |  | 9364 |  |  | 9470 |  |  |  |  | 14 |
| 15 | 033 |  |  |  |  |  |  |  |  |  | $7 \cdot 424$ |  |  |  |  |  |  | 450 | 454 | 458 | 15 |
| 16 |  |  |  |  |  |  |  |  |  | 13 | 919 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 | 6408 |  | 6354 |  | 63 |  | 625 |  | 6198 |  |  | 913 |  | 9228 |  | 1 |  |  |  |  |  |
| 19 | 509 | 5067 |  |  | 4985 | 49 |  | 4903 | 4875 | 16 | 9.404 | 4089 | 4137 | 85 | 4233 | 4281 | 4329 |  |  |  | 19 |
| 20 | 3784 | 3755 | 龶 |  |  |  |  |  | 3553 | 173 | 9．8991 | 904 |  |  | 9 |  |  |  |  |  | 20 |
| 21 | 2473 | ${ }^{2443}$ | 2413 | 2382 | ${ }^{2352}$ | 232 | 22 | 226 | 22 | ${ }^{18} 22$ | 10.39 | 399 | 404 | 409 | 415 | 4205 | 425 | 43 | 4365 |  | 21 |
| 22 | 116 | 113 | 10 | 10 | 10 |  |  |  | 090 | 砣 | 10.88 | 894 | 90 | 9056 |  | 9168 |  |  |  |  | 22 |
| 23 | 985 | 98 | 97 | 9752 |  |  |  |  |  | 19.95 | 11.38 |  | 3956 | 40 |  | 4130 |  |  |  |  | 23 |
|  |  |  |  | 8437 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 25 | 723 |  | 7158 |  |  | 705 |  |  | 694 | 21.6905 | 12 |  |  | 392 |  | 40 | 41 | 418 |  |  | 25 |
| 26 | 59 | 5882 | 5846 |  |  |  |  |  |  | $22 \cdot 5581$ | 12.368 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 4492 | 4453 | 4414 |  | 433 | 42 |  |  |  |  |  |  |  | 404 |  |  |  |  |
| 28 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 29 | 1987 | 1945 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 | 06 | 0633 | 058 |  |  |  |  |  |  |  | $14 \cdot 8486$ |  |  |  |  |  | 8941 |  |  |  |  |
| 31 | 936 | 9320 |  |  |  | 9142 |  |  |  |  | 15 | 351 | 35 | 367 | 3749 | 382 |  | 398 |  |  | 31 |
| 32 | 805 |  |  |  |  |  |  |  |  |  |  |  | 85 | 862 | 8708 | 8789 |  |  |  |  |  |
| 33 | 674 |  |  |  |  |  | 645 | 641 | 6363 | $28 \cdot 63$ | $16 \cdot 33$ | 34 | 35 | 35 |  | 3751 |  |  |  |  | 33 |
|  |  | 53 |  | 5286 |  | 5188 |  |  |  |  | $16 \cdot 82$ |  | 845 | 85 |  | 87 |  |  |  |  | 3 |
| 35 |  | 4071 | 40 | 39 | 39 | 387 | 3819 | 376 | 371 | 30 | $17 \cdot 32$ | 332 | 34 | 34 | 358 | 36 | 37 |  | 394 |  | 35 |
| 36 | 2811 | 2759 | 2707 | 26 | 2604 | 255 |  | 24 | 23 | 31 | 17 |  |  |  | 8547 |  |  | 8820 |  |  |  |
|  |  |  | 1394 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 38 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 75 |  |  |  |  |  |  |  |  |  |  |  | 8183 | 8285 |  |  |  |  |  |  |  |
| 41 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 41 |
| 42 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 433 | 363 | 35 | 3512 |  |  |  |  |  |  |  |  |  |  | 811 | 3264 |  |  |  |  |  |  |
|  |  | 22 |  |  |  |  |  |  | 1817 | 33073 | 2727 |  |  | 8113 | 砣 |  |  |  |  |  | 45 |
| 45 | 1014 | 09 |  |  | 0754 | 0689 | 062 | 056 | 049 | 39．042 | 22.27 | 28 | 295 | 3070 | 318 | 329 |  | 35 | 3638 | 375 | 45 |
| 46 | 9703 | 9637 |  | 9504 | 9438 |  |  |  |  | 39 | 22.76 |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 8392 |  |  |  |  |  |  |  |  | $40 \cdot 7782$ | 23.262 |  |  |  |  |  |  |  |  |  |  |
| 48 |  |  |  |  |  |  |  |  | 65 | 41.64 | 23.75 |  |  |  |  |  |  |  |  |  | 48 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 49 |
| 50 | 4460 | 438 |  |  | 4172 | 4099 | 4027 | 3955 |  | 43.3810 | 24 |  |  | 7856 | 7982 |  | 8235 |  |  |  |  |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 052 | 045 |  |  |  |  |  | 999 |  |  |  |  |  | 272 |  |  |  |  |  |  |  |
| 54 | 92 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 | 79 | 7827 | 7747 |  | 7589 | 7509 | 7430 | 7351 | 7271 | $47 \cdot 7191$ | 27.222 | 236 | 250 | 2641 | 2780 | 29 | 3058 | 319 |  |  |  |
| 56 | 6595 | 6514 | 6434 | 6353 |  |  |  | 6030 | 59 |  | 27.71 | 731 | 745 |  |  |  |  |  |  |  |  |
|  | 52 | 5202 |  |  |  |  |  |  | 46 |  | 28.21 |  |  |  |  |  |  |  |  |  |  |
| 5 |  | 39818 |  |  |  |  |  | 33 | 33 | 50．3220 |  |  |  | 185 | 765 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 51.18 |  |  |  | 24 |  |  |  |  |  |  |  |
| 60 | 1352 | 12 | 1179 | 109 |  | 091 | 0833 | 0746 | 06 |  | 29：6972 | 71 | 727 | 742 |  |  | 788 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 864 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7419 | 73 | 72 |  |  |  |  |  |  |  |  |  |  |  | 24 |  | 27 |  |  |  |  |
| 64 | 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 65 | 479 |  |  |  |  |  |  |  | 4048 | 56.3954 | $32 \cdot 1720$ |  |  |  |  | 254 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 217 | 2080 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 263 |  |  |  |  |
| 6 | 08 |  | － |  |  |  |  |  | － | 58.99 |  |  |  | 7084 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 9057 |  |  | 左 | 析 | 34．15 |  |  | 204 | 21 | 238 | 25 |  | 2912 |  |  |
| 70 | 8244 | 81 | 80 | 79 | 78. | 7739 | 763 | 7537 | 7436 | 60.7335 | 34.646 | 664 | 682 | 699 | 717 | 73 | 752 | 77 | 788 |  |  |
| 71 | 693 | 68 |  | ¢3， |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5415 | 53 |  | 51 |  |  | 47 | 62 4687 |  |  |  | 691 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 63 |  |  |  |  |  |  |  |  |  |  |  |
| 74 | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 75 | 169 |  |  |  | 12 |  |  |  |  | $65^{\circ} 0716$ |  |  |  |  | 197 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 906 | d |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 | 77 | 7645 | 7533 |  |  |  |  |  |  |  |  |  |  |  | 685 |  |  |  |  |  | 78 |
| 79 | 644 | 523 |  |  |  |  |  |  |  | 68.542 | 39.101 | 1213 | 1412 | 1612 | 187 |  |  |  |  |  |  |
| 80 | 5136 | 5020 | 490 | 4790 | 4674 | 4559 | 4444 | 4328 | 4212 | 69.409 | 39.59 | 616 | 仡 | 6569 | 6771 | 697 | 717 | 737 | 757 | 778 |  |
|  | 38 | 3708 | 359 | 3475 | 33 |  | 3124 |  |  | 70.2773 | $40^{\circ} 09$ |  |  |  | 173 | 193 |  |  |  |  |  |
|  | 25 |  |  | 2160 | 2041 | 1923 |  |  | 1568 | 71.14 |  |  | 627 | 6483 | 669 | 689 |  |  |  |  |  |
|  |  |  |  |  | 07 | 06 | 0485 | 0365 | 0245 | 72.01 | 41 |  | 123 | 14.4 | 165 | 186 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 760 | $73 \cdot 7$ |  |  | 114 | 135 |  |  |  |  |  |  |  |
| 85 | 85 | 8459 | 8337 | 821 |  |  |  |  |  | 73.747 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 59 | 58 |  |  | 5458 | 5333 | 52 | 50 | 4956 | 75．48 | 43. |  |  |  | 148 | 170 | 19 | 21 |  |  |  |
|  | 46 | 45 | 438 |  |  |  |  |  |  |  |  |  |  |  |  | 163 |  |  |  |  |  |
| 90 | 2028 | 1898 | 1768 | 1639 | 1509 | 1379 | 1249 | 1119 | 991 | 78 | 44.545 | 5685 | 591 | 6140 | 636 | 659 | 682 | 704 | 727 | 75 | 90 |
|  |  | 0586 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | ${ }_{4}^{45}$ |  |  |  | $628$ |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 5835 |  | ${ }_{81} 1.5564$ | ${ }_{46}{ }^{46}$ |  | 5731 |  | 620 |  |  | 691 |  |  |  |
|  | 547 | 5337 | 5200 | 5063 | 4926 | 4789 | 46 | 4515 | 4377 | $82 \cdot 4240$ | 47.020 | 04 | 0686 | 092 | 116 | 140 | 164 | 188 | 212 | 236 | 5 |
| 96 | 416 | 402 |  | 3748 |  |  | 3332 |  | 3055 |  | 47.515 | 5398 |  |  | 6125 |  |  |  |  |  |  |
|  | 285 |  |  |  |  | 2153 |  |  | 1733 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{8920}^{0230}$ | ＋088 8776 | 8632 | 3487 | 3343 | 819 | 8054 | 7910 | 7760 | $86 \cdot 76$ | $49^{\circ} 4953$ | 5206 | 5459 | 5711 | 5964 | 析 | 6469 | 672 | 6974 |  |  |
|  |  |  |  | $1{ }^{17}$ | $16^{\prime}$ | 15 | $14^{\prime}$ |  |  | $11^{\prime}$ |  | ${ }^{19^{\prime}}$ |  | $17^{\prime}$ | $16^{\prime}$ | $1{ }^{10^{7}}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.
隹

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

| $30^{\circ}$ | SINE |  |  |  |  |  |  |  |  |  | Sinte． |  |  |  |  |  |  |  |  |  | $30^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | $21^{\prime}$ | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{7}$ | $26^{\prime}$ | $27^{\prime}$ | 28 | $29^{\prime}$ |  | 21＇ | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 |  |  |  |
|  | 8631 | 8630 | 86 | 86 | 86 | 86 | 8622 | 8621 | 8619 | 8618 | 05 | 5053 | 50 | 5058 | 5060 | 5063 | 5065 | 5068 |  |  |  |
| 2 | 7262 |  | 725 | 725 | 72 | 7247 |  |  | 723 |  | － | 010 | 01 | 01 | 0121 | 01 | 013 |  | 0141 |  |  |
| 3 | 5893 | 5889 | 5884 | 588 | 587 | 5871 | 586 | 5862 | 5858 | 25853 | 51 | 5158 | 5166 | 5173 | 51 | 518 | 519 | 5204 |  | 5219 |  |
| 4 | 4524 | 45 | 4512 | 450 | 450 | 4495 | 4489 | 4483 | 4477 |  | 2.0201 | 0211 | 02 | 0231 | 0241 | 0251 | 0261 | 0271 | 0281 |  |  |
| 5 | 3155 |  |  |  |  |  |  |  |  |  |  |  | 5277 |  | 5302 | 5314 | 532 | 533 | 535 |  |  |
| 6 | 178 | 1777 | 1768 | 1760 | 1751 | 1742 | 1733 | 1724 | 1715 | $5 \cdot 1707$ | ． 0302 | 0317 | 0332 | 0347 | 0362 | 0377 | 0392 | 0407 | 0422 | 043 |  |
| 7 | 4， | 040 | 039 | 038 | 037 | O3 | －35 | O3 | 033 |  |  |  |  | 5405 | 5422 | 54 | 54 | 75 | 5493 | 551 |  |
| 8 |  |  | 9025 |  |  |  | 8978 |  | 895 | 6.894 | 4.040 | 0422 | 0443 | 0463 |  | 0503 | 0523 | 43 | 0563 | 058 |  |
|  |  |  |  |  |  |  | 7600 | 7586 | 757 |  | 54 |  | 5498 | 5520 | 5543 | 5566 | 5588 | 5611 | 5633 |  |  |
| 10 | 析 | 629 | 628 | 6266 | 625 | 6237 | 222 | 2 | 6 | 8.6178 | － | 0528 | 0553 | 0578 | 060 | 0628 | 0654 | 067 | 0704 | 072 | 10 |
| 11 | 49 | 4925 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 | 4 |  |  |
| 12 | 3572 |  |  |  |  |  |  |  | 3431 | $10 \cdot 3$ |  | 0634 |  |  |  | 0754 |  | 0814 | 0844 |  |  |
| 13 | 2203 | 2184 | 21 | 2146 | 2 | 21 | 20 | 206 | 2050 | $11 \cdot 2$ | 6565 | 5687 | 571 | 575 | 578 | 58 | 5850 | 5882 | 5915 | 594 | 13 |
| 14 | 0834 |  | 07 |  |  |  |  |  |  | 12. |  |  | 0774 | 0810 | 0845 | 08 | 0915 | 50 | 0985 | 102 |  |
| 15 | 9465 | 9443 |  | 9399 | 9377 | 9355 | 9333 | 9311 | 9289 | 12.9267 |  | 5792 | 5830 | 5867 | 5905 | 5943 | 5980 | 6018 | 6056 | 6093 |  |
| 16 | 809 | 8073 | 8049 | 8026 | 8002 | 7979 | 7955 | 7931 | 7908 | 13 | 8.0805 | 0845 | 0885 | 0925 | 0965 | 1006 | 1046 | 1086 | 126 | 116 | 16 |
| 17 | 67 | 6702 | 667 |  |  |  |  | 6552 | 6527 |  | 58 |  |  | 5983 |  |  |  | 6154 |  |  | 17 |
| 18 | 538 | 5332 |  |  |  |  |  | 5173 | 5146 | 15 |  |  | 0996 | 1041 |  | 1131 | 11 | 1222 | 1267 | 131 |  |
| 19 | 3989 | 396 | 3934 | 3906 | 38 | 38 | 3822 | 3794 | 3766 | 16 | $9 \cdot 595$ | 6003 | 6051 | 6099 | 61 | 6194 | 6242 | 6289 | 6337 | 638 |  |
| 20 | 2620 | 259 | 2562 | 2532 | 2503 | 73 | 2444 | 2414 | 23 | 17.2355 | $10 \cdot 1006$ | 1056 | 1106 | 157 | 12 | 12 | 1307 | 135 | 140 | 145 |  |
| 21 | 12 | 122 |  |  |  |  |  |  |  | $18^{\circ} 0973$ | $10^{\circ} 60$ |  |  |  |  |  |  |  |  |  |  |
| 22 | 988 |  |  |  |  |  |  |  |  | 18.9591 | 11.11 |  |  |  |  |  |  |  |  |  |  |
| 23 | 851 | 8480 | 8446 | 8412 | 83 | 8344 | 83 | 276 | 824 | $19 \cdot 8209$ | 11. | 62 | 627 | 63 | 638 | 6445 | 65 | 6561 | 6619 | 667 | 23 |
| 24 | 7144 |  |  |  |  |  |  |  |  | 626 | 12 |  | 1328 | 13 | 1448 | 15 | 1569 | 1629 | 1689 |  |  |
| 25 | 5775 | 5739 | 5702 |  |  | 592 | 5555 |  |  | 5444 | 12 | 6320 | 383 | 446 |  |  | 663 | 6697 | 6759 | 682 |  |
| 26 | 4406 | 4368 | 4330 | 4292 | 4254 | 4215 | 4177 | 4139 | 4100 | 22．4062 | 13. | 1373 | 1438 | 1504 | 156 | 1634 | 1699 | 1764 | 1830 | 189 | 26 |
| 27 | 3038 | 2998 | 295 |  |  |  | 279 |  |  |  |  |  | 649 |  |  |  | 6765 | 683 |  |  |  |
| 28 | 166 | 162 | 158 |  |  | 1463 |  |  |  | $24 \cdot 1298$ | 14.14 |  |  | 1619 |  | 1760 | 1830 |  | 1970 |  |  |
| 29 | 0300 | 0257 | 021 | 0172 | 0129 | 0086 | 44 | 00 | 99 |  | 14 | 65 | 6604 | 667 | 675 | 6823 | 6895 | 6968 | 7041 | 711 | 29 |
| 30 | 8931 | 8886 | 8842 | 8798 | 8754 | 8710 | 8666 | 8622 | 85 | ．8533 | 15 | 158 | 1660 | 173 | 181 | 18 | 196 | 203 | 211 | 218 | 30 |
| 31 | 7562 |  |  |  |  |  |  |  |  | $26 \cdot 7151$ | 15.655 |  |  |  |  |  |  |  | 181 |  |  |
| 32 | 6193 | 614 |  |  |  |  |  |  |  | 275 | 16 |  | 175 |  |  |  |  |  | 225 |  |  |
| 33 | 4824 | 4775 | 4727 | 4678 | 463 | 4581 | 4532 | 4484 | 4435 | 28.4386 | $16^{66}$ | 674 | 68 | 690 | 699 | 7074 | 7157 | 7239 | 73 | 740 | 33 |
| 34 | 3455 | 3405 | 3355 |  |  | 3205 |  | 2 |  | 29.3004 | 17 | 1796 | 1881 | 196 |  |  | 2222 | 2307 | 2393 | 247 |  |
| 35 | 2086 | 2034 | 1983 |  |  |  | 1777 | 25 |  | $30^{\circ}$ | 17 |  | 986 |  |  |  |  |  |  |  |  |
| 36 | 071 | 0664 | 0611 | 0558 | 0505 | 0452 | 0399 | 0346 | 0293 | $31^{\circ}$ | 18.1811 | 190 | 1991 | 2082 |  | 226 | 2353 | 2443 | 2533 |  | 36 |
| 37 | 9348 | 9293 | 923 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 7979 |  | 786 |  |  | 769 | 析 |  |  | 32＇7475 | 19 |  | 702 |  |  |  |  | 257 |  |  |  |
| 39 | 6610 | 655 | 649 |  |  | 63 | 265 | 62 | 6150 |  | 19. |  | 157 | 725 | 735 |  | 7549 | 7647 | 774 | 78 |  |
| 40 | 5241 | 5182 | 5123 | 5064 | 5005 | 47 | 4888 | 4829 | 4770 | 34 | 20.20 | 21 | 2213 | 231 | 241 | 25 | 261 | 271 | 281 | 29 | 40 |
| 41 | 387 | 3812 |  |  |  | 357 |  |  |  |  | 20.706 | 7165 | 7268 | 737 |  |  | 7680 |  |  |  | 4 |
| 42 | 2503 | 24 | 237 |  |  | 219 | 213 |  |  | 36.1946 | 21.21 | 2218 |  | 24 |  |  |  |  |  |  |  |
| 43 | 1134 | 1071 | 100 |  |  | 0818 | 0754 |  |  | 37．0564 | 21.71 |  |  | 7487 | 759 |  | 7810 | 7918 | 802 |  | 4 |
| 44 | 976 | 9700 | 963 |  |  | 944 |  |  |  | 37.91 | 22.2 | 2324 | 2434 |  |  |  | 2876 | 298 |  |  |  |
| 45 | 839 |  |  | 819 |  |  |  |  |  |  | $22 \cdot 7263$ |  |  |  | 771 |  |  |  |  | 827 | 45 |
| 46 | 7027 | 695 |  | 682 |  |  |  |  |  |  | 23.2314 | 242 | 2545 | 266 |  |  |  |  |  |  |  |
| 47 | 5658 |  |  | 54 |  | 531 |  |  |  | $40 \cdot 503$ |  |  |  |  |  |  |  |  |  |  |  |
| 48 | 4289 | 4218 | 414 |  | 4007 | 3936 | 3865 |  | 37 | 41 | 24.24 |  | 2655 | 277 |  |  |  | 3257 |  |  |  |
| 49 | 29 |  |  |  |  |  |  |  |  | 42 |  |  |  |  |  |  |  |  |  |  |  |
| 50 | 15 | 1477 |  |  | 1257 | 1183 | 1110 | 1036 | 09 | 43．0888 | $25^{2}$ | 26 | 276 | 289 | 30 | 3142 | 32 | 339 | 35 | 364 | 50 |
| 51 | 01 | 0107 |  |  |  | 980 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 881 | 873 | 86 | 85 |  | 8431 |  |  | 82 | $44^{\circ}$ | 26.26 |  | 287 | 300 |  |  |  | 352 |  |  |  |
| 53 | 744 | 736 | 72 |  |  | 705 |  |  |  | $45^{\circ}$ |  |  |  |  |  |  |  |  |  |  |  |
| 54 | 607 | 599 |  |  |  | 5678 |  |  |  | $46^{\circ} 5359$ |  |  |  | 312 |  |  |  | 3665 |  |  |  |
| 55 | 470 | 462 |  |  |  | 4302 | 4221 | 413 | 40 | 47．397 | 27.7 |  |  |  |  |  | 8595 | 8732 | 387 |  |  |
| 56 | 3337 |  |  |  |  |  | 2843 |  |  |  |  |  |  | 32 |  |  |  |  |  |  |  |
| 57 | 1968 | 188 |  |  |  |  | 1465 |  |  | $49 \cdot 1213$ |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 059 | 051 | 042 |  | 0258 | 0173 | 0087 |  |  | 49.98 | 29.29 |  | 32 | 335 |  |  |  |  | 408 |  |  |
| 59 | 92 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 | 7861 | 7773 | 7685 |  | 75 | 7420 | 7331 | 7243 | 7155 | 51 | $30 \cdot 3$ | 31 | 331 | 347 |  |  | 392 | 407 | 422 | 437 | 60 |
| 61 | 6492 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 512 | 50 |  |  | 47 | 466 |  |  | 439 | 53.4302 | $31 \cdot 3$ |  |  |  |  |  | 405 | 420 |  |  |  |
| 63 | 375 |  |  |  |  | 329 |  |  |  | 54 | $31 \cdot 8$ |  |  | 865 |  |  |  |  |  |  |  |
| 64 |  |  |  |  |  |  |  |  |  |  |  |  |  | 370 |  |  | 4183 | 4343 |  |  |  |
| 65 | 101 | 092 | 082 |  |  | 0538 | 0442 | 03 |  | 56.0155 | 32.82 | 843 | 85 | 87 | 89 |  | 9248 | 9411 | 957 |  |  |
| 66 | 96 |  |  |  |  | 916 |  |  | 887 |  | $33 \cdot 33$ |  | 361 |  |  |  |  |  |  |  |  |
| 6 | 8278 |  |  |  |  |  | 7687 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 |  |  |  |  |  |  | 630 |  |  | 58.6008 |  |  |  |  |  |  |  | 461 |  |  |  |
| 69 | 55 | 5439 | 533 | 5236 | 5134 | 5033 | 4931 | 482 | 47 | 59. | 34．84 |  | 881 |  |  |  |  | 968 | 985 | ， |  |
| 70 | 417 | 4068 |  |  |  |  | 35 |  |  | 60：3244 | 35．352 |  | 3872 | 404 | 4224 |  |  | 4750 | 4926 |  | 70 |
| 71 | 28 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 1433 | 13 |  |  |  | 09 |  |  |  | 62.04 | 36.36 |  |  | 4 | 43 | 45 | 左 | 488 | 506 |  |  |
| 73 | －06 | 9957 |  |  |  | 952 |  |  | 920 | $62 \cdot 909$ | $36 \cdot 8$ | 885 | 903 | 92 |  |  | 977 | 995 | ＋13 |  |  |
| 74 | 8695 |  |  |  |  | 8157 | 8042 |  | 7 | 63 |  | ， | 408 | 221 |  |  | 483 |  | 2078 |  |  |
| 75 | 7326 | 7216 | 710 | 699 | 6885 | 6775 | 6664 | 655 | 6443 | 64：6333 | $37 \cdot 87$ | 896 | 914 | 933 | 952 | 971 | 990 | ＋09 | 027 | 046 |  |
| 76 | 59 | 58 | 5734 | 5622 | 5510 | 5398 |  | 517 | 506 | 65 | 38.38 |  | 420 | 439 |  |  |  | 5158 | 538 |  |  |
| 77 | 4588 |  |  |  |  | 4022 |  |  |  |  |  |  | 926 | 945 |  |  |  |  | 041 |  |  |
| 78 | 3219 | 31 |  | 287 | 27 | 2646 | 2531 | 241 | 230 |  | 39 |  | 咗 | 451 | 470 | 490 |  | 531 | 548 |  |  |
| 79 | 185 | 1734 | 161 |  | 1386 | 126 | 1153 | 1037 | 0920 | 68.080 | $39 \cdot 8$ | 917 | 937 | 956 |  |  |  | 036 | 05 |  |  |
| 80 | 0482 |  |  |  |  |  |  |  |  | 68.942 |  | 225 | 4， | 462 |  |  |  |  | 5630 |  |  |
| 81 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 7744 | 762 | 750 | 73 | 726 | 714 | 702 | 68 | 677 | 70．6657 | 41.412 | 433 | 453 | 474 | 494 | 51 | 53 | 536 | 57 |  |  |
| 83 | 637 | 6253 | 6175 |  | 5886 | 5308 | 4 | 552 | 539 | 71.527 | 41.91 | 938 | 959 | 980 | 5 | 521 | 5 | 5733 | 0841 |  |  |
| 84 | 5006 | 4882 | 4759 | 4635 | 4512 | 4388 | 4264 | 4140 | 4016 | 72．3893 | 42.4225 | 4436 | 4647 | 485 | 506 | 527 | 5490 | 570 | Sal |  |  |
| 85 | 363 | 351 | 3387 | 3262 | 3137 | 3011 | 2886 | 2761 | 2636 | 73．2510 | 42.9275 | 94 | 9702 | 9915 | ＋129 | 0342 | 0555 | 0768 | 0981 | 119 |  |
| 86 | 2268 | 214 | 2015 |  | 1762 | 1635 | 1508 |  | 1255 | 74 | 43.4 | 45 | 47 | 497 |  |  |  |  | 605 |  |  |
| 87 | 089 | ， | 2043 |  | ） | 259 | －17 | － | 987 |  | $43 \cdot 9$ | Sg | 981 | 103 | 249 | 04 | 068 | 936 |  |  |  |
| 88 | 953 | 9400 | 927 | 914 | 901 | 8882 | 875 | 86 | 849 | $75 \cdot 836$ | 44．4436 | 464 | 486 | 508 | 531 | 55 | 57 | 597 | 6193 | 641 | 88 |
| 89 | 8161 | 8030 | 285 |  | 析 | 7506 | 7375 |  | 713 | 698 | 44.947 | 970 | 992 | －147 | 037 | －593 | 081 | 1040 | 26 | 148 | 89 |
| 90 |  | 6659 | 6527 |  | 62 | 6130 | 5997 | 5865 | 5732 | $77 \cdot 559$ | 45.45 | 475 | 4979 | 5205 | 543 | 5656 | 588 | 6108 | 633 |  | 90 |
| 91 | 542 | 38 |  |  | － | 437 | 4619 | 4485 | 435 | 78．4217 | $45^{\circ} 95$ | 985 | 50 |  |  |  | ， |  |  |  |  |
| 92 | 405 | 3919 | 37 |  | 35 | 337 | 3242 | 31 | 2970 | 79.283 | $46 \cdot 462$ | 485 | 50 | 53 | 55 | 57 | 60 | 6243 | 64 |  | 92 |
| 93 | 2685 | 2548 | 2 |  | 213 | 2001 | 1 | 172 |  | 80\％145 | $46 \cdot 967$ | 991 | 114 | 037 | 061 | 0845 | 107 | 131 | 154 |  | 93 |
| 94 | 1316 | 117 | 103 | 090 | 63 | 0624 |  | 03 | 02 | 81.00 | 47.4728 | 496 | 520 | 543 | 567 | 5908 | 614 | 6379 | 661 | 685 | 94 |
| 95 | 9947 | 9807 |  | 9528 |  |  |  |  | 8828 | 81.8688 | $47 \cdot 977$ | －017 | 0255 | 0494 | 07 | 0970 | 120 | 1447 | 168 | 192 | 95 |
| 96 | 8578 |  | 82 |  |  | 781 |  |  |  |  |  |  |  |  |  |  | 627 | 矿 |  |  |  |
|  | 7209 | 7066 | 926 |  | 6 |  | 6353 | 621 | 6067 | 8359 | 4898 | ＋12 | 036 | 060 | 085 | 109 | 133 | 1583 | 182 | 2069 | 97 |
| 98 | 584 | 56 | 555 | 5408 | 263 | 5119 | 4975 | 4830 | 468 | 84＊454 | 49.492 | 5175 | 542 | 56 | 591 | 61 | 64 | 665 | 6896 | 14 |  |
|  | 447 | 4325 | 4180 | 34 | 368 | 3743 | 2597 | 2072 | 3 | 85.3159 | 49.9880 | －228 | 0477 | 0725 | 0973 | 1222 | 1470 | 178 | 967 | 121 | 99 |
| 100 | 3102 | 2955 | 2808 | 2661 | 2514 | 2366 | 2219 | 2072 | 1924 | 86．177 | $50 \cdot 5030$ | 5281 | 5532 | 5783 | 6034 | 6285 | 6536 | 6786 | 7037 | 288 | 100 |
|  | $40^{\prime}$ | 39 | $38^{\prime}$ | $37^{\prime}$ | 36 | 35 | 34 | $33^{\prime}$ | $32^{\prime}$ | $31^{\prime}$ | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | $37^{\prime}$ | $36^{\prime}$ | 35 | 34 | 33 | 32 | $31^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $9^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

|  | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $0^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\circ}$ | $51^{\prime}$ | 52 | 53 | $54^{\prime}$ | $55^{\prime}$ | $56^{\prime}$ | 57 | 58 | 59 |  | $51^{\prime}$ | $52^{\prime}$ |  | 54 | $55^{\prime}$ | $56^{\prime}$ | $57^{\prime}$ |  |  |  |
|  | 8587 | 8585 | 858 | 8582 | 858 | 85 | 8578 | 85 | 8575 | ＇8573 | 5125 | 5128 | 5130 | 5133 | 5135 | 51 | 5140 | 5143 | 145 |  |  |
|  | 7173 | 717 | 7167 | \％ | 716 | 71 | 715 | 715 |  | $1 \cdot 71$ | $1 \cdot 02$ | 0256 |  |  | 0271 | 02 | 0281 | 0286 |  |  |  |
|  | 5760 | 5755 | 5751 | 5746 | 5742 | 573 | 5733 | 5728 | 5724 | 2.5720 | 1.5376 | 5384 | 53 | 539 | 5406 | 5414 | 54 | 5429 | 5436 | 5444 |  |
|  | 4346 | 434 | 433 |  | 4323 | 4317 | 4311 | 4305 | 429 | 3.42 | －05 | 0512 | 0522 | 05 | 0542 | 0552 | 0562 | 0572 | 582 | 0592 |  |
|  | 2933 | 2926 | 2918 | 1 | 2903 | 289 | 2888 | 2881 | 2873 | 4.2866 | 2.5627 | 5640 | 5652 | 5665 | 5677 | 5690 | 5702 | 5714 | 5727 | ｜ 5739 |  |
|  | 152 | 15 | 1502 | 1493 | 1484 | 1475 | 1466 |  | 1448 | 5.143 | 3.0753 | 0768 | 0783 | 0797 | 0872 | 0827 | 0842 | 0857 | 0872 | 8887 |  |
|  | －10 | Oos | 0085 | 0075 | O0 |  |  |  |  |  |  | 580 | 591 |  | 5948 | 59 |  |  | 6018 | 6035 |  |
|  | 869 | 86 | 8669 | 8657 | 8645 |  |  |  | 8597 | 6.858 | $4 \cdot 1003$ | 102 | 1043 | 1063 | 1083 | 1103 | 1123 | 1143 | 1163 | 1183 |  |
|  | 72 | 7266 | 7253 | 7239 | 7226 | 7212 | 717 |  | 717 | $7 \cdot 715$ | 4.6129 | 6151 | 6174 | 61 | 6219 | 62 | 6264 | 628 | 630 | 6331 |  |
| 0 | 5866 |  | 5836 | 5821 | 580 | 5792 | 577 | 5762 | 5747 | ． 5732 | 5．1254 | 1279 | 130 | 132 | 135 | 1379 | 1404 | 1429 | 454 | 1479 | 10 |
| 11 | 4453 | 4436 |  | 4006 |  |  |  |  |  | 9.4305 |  |  |  |  |  |  |  |  |  |  |  |
|  | 303 | 30 | 3004 | 2986 | 29 |  |  |  | ， | 10.287 | 6.1505 |  |  |  |  |  |  |  | 1745 |  | 12 |
|  | 162 | 16 | 1587 | 1568 | 154 | 1529 | 1 |  | 14 | 11.14 | \％ | 6661 | 66 | 67 | 67 | 67 | 6825 | 685 | 6890 | 692 | 3 |
|  | 021 | 019 | 0171 | 015 | 012 | 01 | 00 |  | 0045 |  | $\cdot 17$ | 17 | 18 | 18 | 18 | 1931 | 1966 | 2001 | 2036 | 2070 | 14 |
| 15 | 879 | 8777 | 8755 | 8732 | 8710 | 8687 | 8665 | 42 | 8620 | 12.85 | 7.6881 | 6919 | 695 | 6994 | 7031 | 7069 | 7106 | 714 | 7181 | 7218 | 5 |
| 16 | 7386 | 73 | 38 | 14 | 90 | 7266 | 7243 | 7219 | 7195 | $13 \cdot 7171$ | 8.2007 | 2047 | 2087 | 2127 | 2167 | 2207 | 2246 | 2286 | 2326 | 2366 | 16 |
|  |  |  | 5922 | 5896 | 587 |  |  |  |  | 1451 |  | 7175 | 721 |  |  | 73 |  | 7429 | 7472 |  | 7 |
|  | 45 | 45 | 308 | 4479 | 4452 | 44 | 4398 | 4371 | 4344 | 15. |  | 2303 | 2348 |  | 2437 | 2482 | 2527 | 2572 | 2617 | 266 | 18 |
|  | 3146 |  |  | 30 |  |  |  | 2947 | 2919 | 16288 | 9.7383 | 743 | 747 | 752 | 75 | 7620 | 7668 | 7715 | 7762 | 7810 | 19 |
| 20 | 173 |  |  |  |  |  |  | 1523 | 1493 | $17 \cdot 1463$ | 10.2509 | 255 | 研 | 2658 | 2708 | 2758 | 2808 | 285 | 290 | 2958 | 20 |
| 21 | 0319 | 0288 | 0256 | 0225 | 0194 | 0162 |  | 0099 | 0068 | $18^{\circ} 0037$ | 10 | 768 | 773 |  |  | 7896 |  | 8001 |  |  | 21 |
|  | 89 | 88 | 8840 | 88 | 877 | 87 |  | 86 | 8643 | 861 | $11 \cdot 2$ | 2814 | 286 |  |  | 3034 | 3089 | 3144 |  | 325 | 22 |
|  | 74 |  | 7424 | 7389 |  |  |  |  | 仡 | 19.718 | 11.78 |  | 800 |  | 81 | 81 |  | 828 | 83 |  | 23 |
|  | 607 | 60 | 600 | 5971 | 593 | 59 | 5864 | 5828 | 192 | 20.575 | $12 \cdot 3$ | 307 | 313 |  | 3250 | 3310 | 3370 | 343 | 3489 |  | 24 |
| 25 | 466 | 4628 | 4591 | 4554 | 4516 | 44 | 4442 | 4404 | 4367 | 21．4329 | 12.813 | 319 | 82 | 8323 | 8385 | 448 | 851 | 8572 | 8635 | 8697 | 25 |
| 26 | 3252 | 3213 | 3175 | ， | 3097 | 3058 | 3019 | 2980 | 2941 | 22 | 13 | 3326 | 3391 | 3456 | 3521 | 3586 | 3651 | 3715 | 3780 | 3845 | 26 |
|  | 183 |  | 175 | 18 | 678 |  |  |  | 1516 | 23.14 |  |  |  |  |  |  | 8791 | 858 |  |  |  |
| 28 | 042 | 0384 | 03 | 300 | 0258 | 02 | 0174 | 0133 | 00 | 24.0 | 14 | 3582 | 3652 | 372 |  |  | 3931 | 400 | 407 | 414 | 28 |
|  | 90 |  | 8925 | 82 | 8839 |  |  |  | 8665 | 24.86 | 14.86 |  |  |  |  | 899 | 907 | 914 | 92 |  | 29 |
| 30 | 75 |  |  |  | 7419 | 7375 |  |  | 7240 | 25.719 | 15 | 3838 |  |  | 4062 | 137 | 421 | 428 | 436 | 43 | 30 |
| 31 | 618 | 61 | 6093 | 60 | 600 | 5954 |  |  | 5815 | ． 5 | 15 |  |  |  | 9198 | 927 |  | 943 |  |  |  |
|  | 477 | 472 | 467 | 462 | 458 | 45 | 448 | 4437 | 4389 | $27^{\circ} 4$ | 16 | 409 | 417 | 425 | 4333 | 44 | 4493 | 457 | 465 | 473 | 32 |
|  | 335 |  |  | ， | 31 |  |  |  | 29 | 28. | 16 | 92 | 93 | 938 |  | 9551 | 9633 | 971 | 9798 | 88 | 33 |
| 34 | 194 | 1894 | 18 | 93 | 1742 | 16 | 1640 |  | 153 |  | 17 | 43 | 44 | 45 | 4604 | 46 | 47 | 485 | 494 | 502 | 34 |
| 35 | 053 | 0479 | 04 | 03 | 032 | 02 |  |  | 113 | 30. | 17 | 947 | 95 | 96 | 9739 | 982 | 99 | tool | 0089 | 017 | 35 |
| 36 | 91 | 9065 |  | 8957 |  |  |  | 8742 | 8688 | 30．8634 | 18 | 4605 | 4695 | 4785 | 4875 | 4965 | 5055 | 5144 | 5234 |  | 36 |
| 3 | 770 |  | 594 | 7538 |  |  |  |  | 7263 | $31 \cdot 72$ | 18.96 | 9733 |  |  |  |  | 0195 | 228 |  |  | 37 |
| 38 | 629 | 6235 | 6178 | 6121 | 6065 | 6008 | 595 | 5894 | 583 |  | 19 | 48 | 495 | 505 |  | 524 | 5335 | 5430 | 552 | 56 | 38 |
|  | 487 |  | 47 |  |  |  |  | 4470 | 441 | 33 |  | 99 | －08 | 018 |  | 0378 | 0476 | 5 | 06 |  | 39 |
| 40 | 346 |  | 3345 | 3286 | 322 | 1 | 310 | 304 | 2987 | 34292 | 20.50 | 511 | 217 |  | 5417 | 5516 | 5616 | 71 | 5816 | 597 | 40 |
| 41 | 20 | 199 | 1929 | 186 | 1807 | 1745 |  |  |  | 35 | $21 \cdot 014$ | 024 |  |  |  |  |  |  |  |  |  |
| 42 | 06 | 057 | 05 | 045 | 0387 |  |  |  | 0136 | 36 |  | 537 | 547 |  |  |  |  | 600 | 610 |  | 42 |
| 43 | 922 | 916 | 9096 | 9032 |  |  |  |  | 871 | 36 | 22.039 | 05 | 0608 |  |  | 09 | 1037 | 1145 | 1252 |  | 43 |
|  | 781 | 774 |  |  | 7549 | 7483 | 74 |  |  |  |  | 5629 | 573 | 58 |  | 60 | 617 | 628 | 6397 | 6507 | 4 |
| 45 | 639 | 63 |  | 6196 | 612 |  | 59 |  |  | 38 |  |  |  |  |  | ， | 131 | 163 | 15 | 165 | 45 |
| 46 | 49 | 4916 |  | 4778 | 4710 |  |  |  | 4435 | 39－4366 | 23.5770 |  |  |  |  |  |  | 6573 |  |  |  |
| 4 | 357 | 35 | 3431 |  | 3291 | 3220 |  |  |  | 40．293 | 24.089 | 1012 |  |  |  |  |  |  |  | 195 |  |
| 48 | 215 |  |  | 13 | 1871 |  | 1728 |  | 15 | $41 \cdot 15$ | 24 | 61 | 626 |  |  | 66 |  | 685 | 697 |  | 48 |
| 49 | 074 | 067 | 059 | 0525 | 452 |  |  |  | 015 | 42.00 | 25 | 126 | 139 |  |  |  | 1880 | 200 | 212 | 224 | 49 |
| 50 | 933 | 9256 | 9182 | 910 | 032 | 8958 | 888 |  | 8733 | $42 \cdot 86$ | $25^{\prime} 62$ |  |  |  | 677 |  | 020 | 714 | 27 | 739 | 50 |
| 51 | 79 |  |  |  |  |  |  |  |  | $43 \cdot 7232$ |  |  |  |  |  |  | 2161 | 2288 |  |  | 51 |
|  | 65 | 6427 |  | 6271 | 6194 | 6116 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 52 |
| 5 | 509 | 501 | 4933 | 4854 | 4774 | 46 | 46 | 45 | 44 | 4 | 27 | 1780 | 1912 |  |  | 2309 | 2441 | 257 |  |  | 3 |
| 5 | 367 | 359 | 3516 |  |  |  |  |  | 303 | 46.29 | 27 | 690 | 70 | 717 | 73 |  | 582 |  | 785 |  | 54 |
| 55 | 22 | 2182 | 2100 | 2018 | 1936 |  |  |  | 160 | 47－1524 | 28.1 | 2036 | 2173 | 231 | 24 | 258 | 2722 | 285 | 299 | 析 | 55 |
| 56 | 085 | 076 |  | 0600 | 0516 |  |  |  |  | 48.0098 | 28.70 | 7164 | 730 |  |  |  | 7863 |  |  |  | 56 |
| 57 | 943 | 935 | 92 | 91 | 90 |  | 8927 | 884 | 8756 | 48.8671 | 29 | 2292 | 2434 |  |  | 286 | 3003 |  | 328 |  |  |
|  | 80 | 793 | 78 | 77 | 767 |  | 75 |  | 733 | $49 \cdot 72$ | $29 \cdot 72$ |  |  |  |  |  |  |  |  |  | 58 |
| 59 | 66 | 652 | 64318 | 6346 | 6258 | 6170 | 6082 |  | 590 | $50 \cdot 58$ | 30．2400 | 25 | 26 | 28 |  | 313 |  | 343 | 357 |  | 59 |
| 60 | 5197 | 51 | 5018 | 4929 | 㖪 | 4749 | 466 | 457 | 4480 | 51.4390 | $30 \cdot 7526$ | 7675 | 782 | 797 | 8125 | 827 | 8424 | 857 | 872 | 88 | 60 |
|  | 378 |  |  |  | 3420 |  |  |  |  | 52.2963 | 31.265 | 2803 |  |  |  | 3412 |  |  |  |  | 61 |
|  |  |  |  |  |  |  | 18 |  |  | 53.5 |  |  |  |  |  |  |  |  |  |  | 62 |
|  | 095 | 08 | 07 |  | 0581 | 04 | 03 | 02 | 020 | －110 | 32 |  |  |  |  |  |  |  |  |  | 63 |
|  |  |  |  |  | 9162 |  |  |  |  | 54.8 | $32 \cdot 8$ | 81 | 83 |  |  |  |  | 914 | 93 |  | 64 |
| 65 | 81 |  |  |  |  |  |  |  |  | 55. | 33．31 | 331 | 347 |  |  |  |  | 428 | 4451 | 寿 | 65 |
| 66 | 67 |  | 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 530 | 520 | 510 | 50 | 4903 | 48 | 47 | 46 | 450 |  |  |  | 37 |  | 407 | 4240 |  | 4574 |  |  | 67 |
|  |  |  |  |  |  |  |  |  | 307 | 58.29 | $34 \cdot 85$ |  | 88 |  |  | 9378 |  | 978 | 988 |  | 68 |
| 69 | 2477 | 237 | 22 | 2168 | 2065 | 1962 |  |  |  |  |  |  |  |  |  |  |  |  | 503 |  |  |
| 70 | 1063 |  | 085 | 0750 | 0645 | 0541 | 0436 | 033 | 0227 | 60.012 | 35.8 | 895 | 9129 | 930 | 947 | 965 | 982 | ＋003 | 017 | 035 | 70 |
|  | 96 |  |  |  |  | 9120 | 9014 | 8908 |  | 60.86 | $36 \cdot 39$ | 408 | 426 |  | 46 | 479 |  | 514 | 532 | 500 | 71 |
|  | 223 |  |  |  |  |  |  |  |  | $61 \cdot 7268$ | 36．90 | 921 | 939 |  |  | 99 |  |  | 4 |  | 72 |
|  | 682 | 671 | 660 | 64 | 6387 | 6278 | 6169 | 6060 | 595 | 62 | $37 \cdot 415$ | 4338 | 452 | 4703 | 4885 | 506 | 524 | 5432 | 0759 |  | 73 |
|  | S410 | 52 |  |  | ¢ 6 | 4857 | 4747 | 4636 | 4525 | 63.4415 | 37.928 | 946 | 965 | 983 | ， | 02 | 0390 | 0575 | 075 | 094 | 74 |
|  | 3996 | 388 | 37 | 366 | 3549 | 3437 |  | 3212 |  | 6． | 38 |  | 4 | 496 |  | ， |  | 矿 | 5904 | 609 | 75 |
| 76 | 2583 | 247 |  |  |  | 2016 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
| 77 | 1170 | 10 | 09 | 0825 | 071 | 0595 | 0480 | 036 | 0249 | 66.013 | 39．465 | 4850 | 5042 | 523 | 542 | 5619 | 5811 | 6003 | 6195 | 638 | 77 |
| 78 | 975 |  |  |  |  |  |  |  | 8824 | 66．870 | 39．978 | 997 | 1173 | 036 | 0562 | 075 | 0952 | 114 | 134 | 153 | 70 |
| 79 | 8343 | 82 | 810 | 7989 | 7871 | 7753 | 7635 | 7517 | 7399 | $67 \cdot 7281$ | 40．4909 | 5106 | 5303 | 550 | 5698 | 5895 | 6092 | 628 | 6486 | 668 | 70 |
| 80 | 6 | 6810 | 6691 | 65 | 6452 | 332 | 621 | 609 | 5973 | 68．5854 | 41.0034 | 023 | 043 | 063 | 0833 | 103 | 123 | 143 | 163 | 183 | 80 |
|  |  |  | 527 |  |  | 4912 | 4790 | 4669 | 4548 | 69．442 | 41.515 | 536 | 556 | 57 |  | 617 | 6373 | 6575 | 677 |  | 81 |
| 82 | 4103 | 398 | 38 | 2318 | ， | 3491 | 3368 | 3245 | 123 | 70．30 |  | 249 | 069 |  | 104 | 130 | 513 | 718 |  | 2127 | 82 |
| 83 | 2689 | 2560 | 24 | 23 | 21 | 2070 | 1946 | 1822 | 1697 | $71 \cdot 1573$ | 42.541 | 5618 | 582 | 603 | 623 | 644 | 6654 | 686 | 06 | 27 | 83 |
| 84 | 127 | 115 |  | ， |  | 0649 | 523 | O398 | 0272 | 72．0146 |  | 0746 | 095 | 116 | 1375 | 158 | 1794 | 20 | 2213 | 242 | 84 |
| 85 | 986 | 973 | 960 | 9482 | 9355 | 9228 | 91 |  |  |  |  |  | 608 |  |  | 6722 |  |  |  |  | 85 |
|  | 84 | 83 | 819 | 8064 | 7936 | 7807 | 7679 | 7550 | 42 | $73 \cdot 7293$ |  | 100 |  | 23 |  | ， | 2015 | 228 | 析 |  | 86 |
|  | 7036 | 6906 | 6776 | 6646 | 6516 | 6386 | 6256 | 6126 | 5996 | 74.586 | 44.591 | 612 | 634 | 656 | 6781 | 69 | 72 | 743 | 764 | 矿 | 8 |
| 88 | 5622 | 549 | 5360 | 5229 | 5097 | 4966 | 4384 | 析 | 457 |  |  | ， | 14 | 1697 | 916 | 213 |  | 5 | 左 | 析 | 8 |
| 89 | 4209 | 析 |  | 3811 | 3678 | 3545 | 3412 | 3279 | 3145 | 76．3012 | 45.6163 | 638 | 6607 | 6830 | 7052 | 727 | 749 | 77 | 794 |  | 89 |
| 90 | 2796 | 26 | 2527 | 23 | 2258 | 24 | 1989 | 1855 | 1720 | 77－1585 | $46 \cdot 1288$ | 1513 | 1738 | 196 | 218 | 241 | 263 | 28 | 308 | 3310 | 90 |
| 91 92 | 1382 | 1247 | 161 | 09 |  |  | 056 | 0431 | 0295 |  |  |  |  |  |  | 550 | 1917 | 8004 | 8231 |  |  |
| 92 |  |  |  |  |  | 9282 | 9145 | 9007 | 8869 | 78.873 |  | 176 | 79 | 22 | 2458 | 268 | 291 | 31 | 337 |  | 92 |
| 93 94 | 8556 | 8417 | 8278 | 81 | － | 7861 | 7722 | 7583 | 744 | 79.730 | $47 \cdot 6665$ | 689 | 7129 | 73 | 7593 | 782 | 805 | 82 | 852 | 87 | 93 |
| 94 95 | 7142 | 7002 |  |  |  |  |  | 6159 | 6019 | 80．587 | 48.1790 | 2025 | 2259 | 2494 | 2729 | 296 | 319 | 343 | 3667 | 390 | 94 |
|  |  |  |  |  |  |  | 4878 | 4736 | 4593 | 81.445 | 48.691 | 7153 | 7390 | 762 | 786 | 810 | 8338 | 85 | 8812 | 9049 | 95 |
|  |  | 2757 |  |  |  |  | 2035 | 33 | 3168 |  | 49.2041 | 2281 | 25 | 2760 | 300 | 32 | 3479 | 3718 | 3958 |  | 96 |
| 98 | 1489 | 1342 | 1196 | 1050 | 0904 | 0757 |  |  |  | 83 |  |  |  |  |  |  |  |  |  |  | 97 |
|  | －075 | 99 |  |  | 9484 | 9336 | 9188 | 9040 | 8892 | 84．87 |  |  | 727 | 815 | 3270 | 86 |  |  |  |  | 98 |
| 100 | 8662 | 8513 | 864 | 8214 | 8065 | 7916 | 7766 | 7616 | 7467 | 84.874 85 | 51.2543 51 | 2792 | 7912 | 8292 | 8541 | 87919 | 4040 | 4147 | 453 |  | 90 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | NE． |  |  |  |  | $9^{\circ}$ |

TRAVERSE TABLES.

|  |  | Cosine. |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{3572}$ | ${ }_{7}^{8570}$ | ${ }_{7137}^{8569}$ | ${ }_{71}^{856}$ | ${ }_{\text {c }}^{85661}{ }^{131}$ |  |  |  |  |  | - 1.5150 |  | ${ }_{0}^{5155}$ | ${ }^{5158}$ | ${ }^{5160}$ |  |  |  |  |  |  |
|  | 57 | 57 |  |  |  |  |  |  |  |  |  |  | 5466 |  |  |  |  | 5503 |  |  |  |
|  | 2288 | 428 | 4275 | ${ }_{4268}$ | 4263 |  | ${ }_{2813}^{4251}$ | ${ }_{2806}^{4245}$ | ${ }^{423}$ |  | - 2.51002 | 0611 |  | 2639 | S802 |  |  |  |  |  |  |
|  | 1430 | ${ }^{14221} 9$ | 1461 | ${ }^{14033} 9$ | ${ }^{13946}$ | ${ }^{1385} 9$ | ${ }^{1337}{ }^{139}$ | ${ }^{1367}{ }^{1388}$ | ${ }_{\text {l }}^{1358}$ | ${ }_{\substack{\text { S.1.1399 } \\ 5 \\ 50907}}$ | 3.08 | ${ }^{0917}$ | ${ }^{0932}$ |  | 0962 |  |  |  | 1022 <br> 6192 |  |  |
|  |  | 8561 | ${ }^{854}$ | ${ }_{8}^{8537}$ |  |  |  | 8489 |  |  |  | 123 | 1243 |  | 6122 |  | ${ }_{123}^{137}$ | ${ }_{134} 17$ |  |  |  |
|  |  | 713 | ${ }_{568}$ |  | ${ }_{5657}^{7091}$ |  |  |  | -597 |  |  |  |  | 6421 |  | ${ }_{162}^{646}$ | 648 | $\xrightarrow{6510} 1$ |  |  |  |
| 11 | 14288 | ${ }^{427}$ | 4255 | 423 | 432 | 4206 | 418 | 4173 | 415 |  | 5.6654 | 16882 | 6709 | 6736 | 6764 | 679 | 6819 | 6846 | 873 |  |  |
| ${ }_{13}^{12}$ |  | ${ }_{141}^{284}$ | ${ }_{\text {238 }}^{283}$ | ${ }_{1373}^{2806}$ | ${ }_{\text {cki }}^{278}$ |  | ${ }_{1315}^{2752}$ | ${ }_{1295}^{2736}$ | ${ }_{2}^{2716}$ |  | 6.1805 | ${ }^{1838} 6$ | ${ }_{7020}^{1864}$ | ${ }_{7052}^{1894}$ | ${ }_{7085}^{1924}$ |  |  |  | 044 |  |  |
| 14 |  | 998 | 996 | 9840 | 991 |  |  |  | 9835 |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 |  | 855 | 853 | ${ }_{8508}$ | 846 | 84631 | 8440 | 848 | 8395 |  | T |  | ${ }_{733}$ | 7368 | 7405 | ${ }_{7463}$ | 788 |  |  |  |  |
| 16 |  | 7123 |  |  |  |  |  |  |  |  | $8 \cdot 24$ |  |  |  |  |  |  |  |  |  |  |
|  |  | 426 | 5637 |  |  | 5591 |  |  | 5514 |  |  |  |  | $\begin{aligned} & 384 \\ & 341 \\ & \hline \end{aligned}$ | $\begin{aligned} & 786 \\ & 886 \\ & \hline 86 \\ & \hline 2 \end{aligned}$ |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 814 | 31 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 |  | 854 |  |  | 8445 |  | 8379 | 8346 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 568 | 7080 |  | 7011 |  | 6981 <br> 5504 | ${ }_{5468}^{6907}$ | 54 |  |  |  | 8573 | 31 | ${ }^{588}$ |  |  |  | ${ }_{8017}^{8988}$ |  |  |
|  |  |  |  |  |  |  |  | 4029 |  |  |  |  |  |  |  |  |  | 402 |  |  |  |
| ${ }_{26}^{26}$ | ${ }^{2863}$ | 2825 | ${ }^{2786}$ | 2747 | ${ }^{2788} 3^{2}$ | ${ }^{2668}$ | 222 |  | 2551 |  |  | 3775 | 4040 | ${ }^{4104}$ | 4169 | ${ }^{4234}$ | 4299 | 4363 | ${ }^{4428}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  |  |  |  |  |  |  |  | 6790 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{2280}$ |  |  |
|  |  |  | 2766 | 2717 | 266 | 2518 |  | 251 |  |  |  |  |  |  | 292 | 0374 |  |  |  |  |  |
|  |  | 136 | 133 | ${ }^{128}$ | 12 | 118 |  | 1080 | 1029 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 858 | 852 | 8472 | 841 | 8364 | 831 | 8256 | 8202 | 8148 | 30-8094 | 18.5414 | 5503 | 5593 | 3 | 5773 | 5882 | 95 | 6042 | 6131 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 4120 | 4061 |  | 3944 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 286 | ${ }_{2807}$ | 2747 |  |  |  |  |  | ${ }_{238}^{238}$ |  | 20.6015 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 42 \\ & 43 \\ & 43 \end{aligned}$ |  | ${ }^{89417}$ | ${ }^{98854} 8$ | ${ }_{8389}^{982}$ | ${ }_{8328} 838$ | 8259 | 8195 | 195 | 95 |  |  |  | ${ }^{6525} 1$ | (1783 | \% 35 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2863 | 2798 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{50}^{49}$ |  |  |  | 8359 |  |  | 981 |  | ${ }_{724}^{948}$ |  |  |  | 219 | 789 |  |  |  |  |  |  |  |
|  | 1715 |  | 7002 | 5926 | ${ }^{6849}$ |  | 6996 |  |  |  |  | 2797 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 287 | 27 | 2708 | 2627 | 2546 | 2465 |  |  | 2222 |  |  |  |  | 852 |  | 893 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 3408 |  |  |  |  |  |  |  |  |  |
|  |  |  |  | ${ }^{2932}$ | 928 | 19594 | ${ }_{8072}$ | ${ }_{7987}^{9425}$ | ${ }^{9384} 1$ |  |  | ${ }^{8561}$ | 3856 |  |  |  |  |  |  |  |  |
| $\begin{gathered} 57 \\ 58 \\ 58 \end{gathered}$ | ${ }_{8} 8158$ | 7070 | 6983 | 6886 | 680 |  | 6635 | 6548 | 6461 |  |  |  |  | 9156 |  | 9445 | 9589 |  |  |  |  |
|  |  |  |  |  | 5375 | 5286 | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 278 |  |  | 2506 | 2415 | 23 | 223 |  |  |  | 6325 |  | 4629 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 63 \\ & 64 \\ & 64 \end{aligned}$ |  | 8491 | 839 |  | 8203 | 81 |  |  | 781 |  |  | 9784 |  |  |  | 042 |  |  |  |  |  |
|  |  | 1706 | 6964 | 6866 | 6769 | 667 | 6574 | 647 |  |  |  | , |  | 526 |  |  | 5 |  |  |  |  |
|  |  | 56 |  |  |  |  | 5136 |  | 493 |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{68}^{67}$ |  |  |  |  |  |  | 3699 | 35981 |  |  |  |  |  |  |  | 5910 | ${ }^{6077}$ | ${ }^{6245}$ | 641 |  |  |
|  |  |  |  | 135 | 1097 | 研 | 032 | 72 |  |  |  | 554. |  |  |  | 623 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 69 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{4} 5$ | ${ }_{2763}$ | 2651 | 2538 |  |  |  |  | 1975 |  |  | 6466 | 665 |  |  | 7213 | 740 |  |  |  |  |
| $\left.\begin{aligned} & 76 \\ & 77 \end{aligned} \right\rvert\,$ | ${ }_{6} 114$ | 1333 | 1219 | 1105 | 0951 | 0877 | ${ }^{0763}$ | 0649 | ${ }^{0534}$ |  |  | 1618 |  | 1997 | 2187 | ${ }^{2376}$ |  |  |  |  |  |
| $\left.\begin{aligned} & 77 \\ & 78 \end{aligned} \right\rvert\,$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 6807 |  |  |  |  |  |  |  |  |  | 757 |  | 78 | 806 | 825 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 3698 | 351 |  |  |  |  |  |  |  |  |  |  | ${ }^{8594} 8$ |  |  |  |
| $\begin{gathered} 82 \\ 83 \\ 83 \end{gathered}$ | ${ }^{2} 28164$ |  | 1200 | 1076 | 0951 | 0826 | 0702 | O57 |  |  |  | 7689 |  |  | 8309 |  |  |  | 9136 |  |  |
| 84 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 7035 |  |  |  | S |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5736 | 56 |  | 339 | 3779 | ${ }^{364}$ | 35 | ${ }_{3383}^{482}$ | 3350 |  |  | ${ }^{2053}$ | ${ }^{3672}$ | 3892 | ${ }_{4111}^{48}$ | 4330 | $\left[\begin{array}{l} 93869 \\ \hline 549 \\ \hline \end{array}\right.$ |  |  |  |  |
| 88 |  |  | 2612 | 2479 | 2345 |  |  | 194 |  |  |  | 860 |  |  |  |  |  |  |  |  |  |
|  |  | 988 |  | 1064 |  |  |  | 906 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8594 | 845 |  |  |  |  |  |  |  |  |  |  | 4294 |  |  |  | 5211 |  |  |  |  |
|  |  |  |  | ${ }_{5314}^{6747}$ | 6608 <br> 5173 | ${ }^{6} 5032$ | ${ }^{683}$ | - 6759 | 460 |  |  | ${ }_{4}^{9237}$ | ${ }^{9} 943$ | ${ }_{483}^{268}$ |  | ${ }^{14} 514$ | ${ }^{0.0376}$ |  |  |  |  |
|  | 430 | ${ }_{4} 5$ | 54 | 388 | 3739 | 3596 | 3454 | 3311 | 31 | 8. | 48. | 2523 |  | 999 |  | 0470 |  |  |  |  |  |
|  |  | $\begin{aligned} & 2737 \\ & \hline 120 \end{aligned}$ |  | 2449 | $23823$ | 216 | 2 |  | 17 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 11016 |  |  | $0.575$ | 24344 | ${ }^{0288}$ |  |  |  |  |  |  | 2996 |  |  |  |  |  |
|  |  | ${ }^{3447}$ | 8299 | 150 |  |  |  |  | ${ }_{7} 7807$ |  | 53 | 13 | 537 | 578 | 0875 | 1121 | 135 | 1615 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $31^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $31^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ |  | $22^{\prime}$ | $23^{\prime}$ | 24 | 25 | 26 | 27 |  |  | $2{ }^{\circ}$ |  |  | 23 | $24^{1}$ | 25＇ |  | 27 |  |  |  |
|  | 8542 | 8540 | 853 | 18537 |  | 85 | 8532 | 8531 | 85 | ＇8528 | 5200 | 5203 | 5205 | 5208 | 10 | 5213 | 5215 | 5218 | 5220 | 5223 |  |
|  |  |  | 70 | 7071 |  |  |  |  | 70 | 1705 | 1.02 | 0405 | 0410 | 0415 |  | 0425 |  |  |  |  |  |
|  |  | 56 | 561 | 56 | 561 |  |  |  | 558 |  |  |  | 5 |  |  | 5 | 56 |  |  |  |  |
|  | 4166 |  | 415 | 41 | S61 | 41 | 41 |  | 411 |  |  | 0811 |  | 0830 |  |  |  |  |  |  |  |
|  | 2708 | 2700 | 2693 |  |  |  |  |  |  | 4.2640 | $2 \cdot 600$ | 6013 | 6026 |  | 6050 | 606 | 6075 | 6088 | 6100 |  |  |
|  | 1249 | 12 | 1231 | 1222 | 1213 | 1204 | 1195 |  | 117 |  | $3 \cdot 1201$ | 121 | 1 |  |  | 1275 |  |  |  |  |  |
|  | 9791 | 97 | 9770 |  | 97 | 973 | 9727 | 9717 |  |  | 3.6 | 649 |  |  |  |  |  |  |  |  |  |
|  | 333 | 8320 | 83 | 8296 | 8284 | 8272 | 8260 | 8248 | 8236 |  | 4.1601 | 1621 | 1641 | 1661 | 16 | 1 | 1720 | 40 | 1760 | 1780 |  |
|  | 874 |  |  | 6833 |  | 6806 | 6792 | 79 | ${ }^{6765}$ |  | 4.6801 | 5824 | 6846 | 6869 | 689 | 6913 | 6936 | 588 | 6980 | 7003 |  |
| 10 |  | 54 | 5385 | 5370 | 535 |  | 5325 | 5310 |  | $8 \cdot 5$ | 5202 |  | 2051 |  | 2101 | 2126 | 2151 | 2175 | 00 | 2225 |  |
| 11 | 3957 | 3941 | 3924 | 3907 | 13891 | 13874 | 13857 | 3841 | ${ }^{3824}$ | 938 | 5.7202 | 7229 | 7256 | 7284 | 731 | 7338 | 736 | 7393 | 7420 | 7448 | 1 |
| 12 | 2499 | 24 | 246 | 24 | 24 | 2408 | 2390 | 2371 | 2353 | 10.233 | 6.2402 | 2432 | 2462 | 2491 | 2521 | 2551 | 2581 | 2611 | 2640 |  | 12 |
| 13 |  |  |  |  |  | 0942 | 0922 | 0902 | 0883 | 11.0863 | $6 \cdot 7602$ | 7634 |  | 769 | 7731 | 776 | 779 |  |  |  | 13 |
| 14 | 95 | 95 | 95 | 95 |  |  |  | 9433 | 近 | 1193 | 7.2802 | 2837 |  |  | 2941 | 297 | 30 |  |  |  | 14 |
| 15 | 8123 | 8101 | 8078 |  | 8033 | 8010 | 7987 |  | 7942 | 12.79 | $7 \cdot 8002$ | 8040 | 8077 | 81 | 8151 | 1 | 321 | 8263 | 8300 | 8338 | 15 |
| 16 |  |  |  |  |  | 6544 |  |  | 64 | 13.64 | 8．3203 |  |  |  |  |  |  |  |  |  |  |
| 17 | 5207 | 51 | 515 |  |  |  | 5052 | 5026 |  | 14. |  | 8445 | 8487 | 8529 | 85 | 861 |  |  |  |  | 17 |
| 18 | 3748 |  |  |  |  |  |  |  | 23 |  |  | 18 | 92 | 3737 | 3782 |  |  | 3916 | 3960 | 4005 | 18 |
| 19 |  | 22 | 2232 | 2203 | 2175 | 1 |  | 2088 | 205 |  |  | 8850 |  | 894 |  | 9039 | 9086 | 9133 | 9180 |  | 19 |
| 20 |  |  |  |  |  |  |  |  |  | 1 | 11 |  | 4103 | ， | 4202 | 4252 | 43 | 43 | 4400 |  |  |
| 21 | 9373 | 9341 | 93 | 92 | 92 | 9214 | 9182 | 19150 | 9118 | 17. | $10 \cdot 9203$ | 9256 | 9308 | 9360 | 9412 | 946 | 95 | 95 | 96 | 9673 | 21 |
| 22 | 7914 | 78 | 7848 | 7815 | 7781 | 7748 |  | 81 | 7648 | 18.76 | 11.4404 | 4458 | 4513 | 4567 | 4622 | 4677 |  |  |  |  |  |
| 23 |  | 64 | 63 | 6352 | 6317 | 6282 | 6247 | 6212 | 6177 | 19.6142 | 11.9604 | 9661 | 9718 | 9775 | 9832 | 988 |  |  |  |  |  |
| 24 |  | － | 49 | 4889 | 4852 | 4816 | 4 | 4743 | 4707 | 20 | 12.488 | 486 | 4923 | 4983 | 50 |  |  |  | 52 |  | 4 |
| 25 | 353 | 350 | 34 | 342 | 33 | 3350 | 3312 | 3274 | 3236 | 21 | 13.0 | 006 | 0128 | 019 | 02 | 0314 | 0377 | 043 | 050 | 0563 | 5 |
| 26 | 2081 | 204 | 200 | 1963 | 1923 | 1884 | 1844 | 1805 | 1765 | 22 | 13：52 | 526 | 5333 | 5398 |  |  |  |  |  |  |  |
| $27$ |  | 051 | 05 | 050 |  | 0418 | 0377 | 0336 | 0295 | 23. | 14.0 | 0471 | － | 0606 | O67 |  |  |  |  |  | 27 |
| 28 | 78 |  |  | 7s7 | 8994 |  | 8909 | 88 | 8824 |  |  | 5674 | 57 | 5813 | 5883 |  | 60 |  | 61 |  | 28 |
| 29 | 770 |  |  | 75 |  |  |  |  |  |  |  | 0877 |  |  |  |  |  |  |  |  | 29 |
| 30 |  |  |  |  |  |  |  |  | 5883 | 25.5838 |  |  |  |  |  | 16377 |  |  | 660 |  |  |
| 31 | 478 |  |  |  |  | 45 |  | 446 | 4413 |  | $16 \cdot 12$ | 1282 | 1359 | 1436 | 13 | 1590 | 166 | 1744 | 182 |  | 31 |
| 32 | 333 | 32 | 172 | 31 |  |  | 157 | 2991 |  |  |  | 6485 | 6564 |  | 6723 |  |  |  |  |  |  |
| 33 |  |  |  |  |  | 16 | 1572 | 1522 | 1472 | 28. | $17 \cdot 16$ | 168 | 176 | 1851 | 19 | 2015 |  |  |  |  | 33 |
| 34 |  | 03 | 0310 | 0259 | 0207 | 0156 | 0104 | 0053 | －001 |  | 17.68 | 689 | 6974 | 705 | 71 | 72 | 73 |  |  |  | 4 |
| 35 | 8955 | 89 | 88 | 879 | 87 | 86 | 8637 | 8584 | 8530 | 29.847 | 18.20 | 209 | 218 | 226 | 2353 | 24 | 252 | 26 | 27 |  | 35 |
| 36 | 7496 | 74 | 59 | 733 | 72 | 72 | 7769 |  | 7060 | 30.70 | 18.72 | 72 | 7385 | 7474 | 75 | 7233 | 7742 |  |  |  |  |
| 37 | 60 |  | 592 | 5870 |  |  | 57 | 56 | 5589 | $31 \cdot 55$ | 19.24 |  |  | 2682 | 27 |  |  |  |  |  | 37 |
| 3 |  |  | 446 | 440 | 43 | 429 | 4234 | 4176 | 4119 |  | $19 \cdot 76$ |  |  | 78 |  |  | 817 |  |  |  | 38 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 |  |  | 15 | 14 |  |  | 1299 | 1238 |  | $34 \cdot 1117$ |  |  |  | 8305 |  | 8503 |  |  |  |  |  |
| 41 | 020 |  |  |  |  |  |  |  |  |  |  |  |  | 3512 | 3614 | 3 |  | 39 | 4021 |  | 41 |
| 42 | 87 | ${ }^{86}$ | 86 | 85 | 84 |  |  | 8300 | 82 |  |  | 85 | 815 | 872 |  |  |  |  |  |  | 42 |
| 43 | 523 |  |  |  |  |  | 68 |  |  |  |  |  | S21 |  |  |  |  |  |  |  | 43 |
| 44 | 582 | 57 |  | 56 | 55 | 54 | 5429 |  | 528 | 37•52 |  |  | 902 | 913 |  |  |  |  |  |  | 45 |
| 45 | 4370 | 430 | 42 | 41 | 40 | 403 | 396 | 3893 | 3825 | 38.375 | $23 \cdot 40$ | 4119 | 4231 | 434 | 445 | 45 | 46 | 47 | 490 | 5013 | 45 |
| 46 | 2912 | 2842 | 27 | 27 | 26 | 25 | 24 | 2424 | 2354 | ${ }^{39}{ }^{\circ}$ | $2{ }^{23} 92$ | 932 | 943 | 95 | 96 |  |  |  |  |  | 46 |
| 47 | 14 | 13 | 13 |  |  |  |  |  | 08 |  | 24.4 | 45 | 46 | 475 |  |  |  |  |  |  | 47 |
|  |  |  |  |  |  |  |  |  | 9413 | 40 |  |  |  |  |  |  |  |  |  |  | 48 |
|  | 853 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | 70 |  |  |  |  |  | 6624 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 51 |  |  |  |  |  | 523 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 4161 | 408 | 40 | 39 |  | 376 | 36 | 36 | 3531 |  |  | 05 | 0667 |  |  |  |  |  |  |  | 52 |
|  |  | 2623 | 25 | 24 | 23 | 2302 | 2221 | 2141 | 2060 | $45 \cdot 198$ | ${ }^{27} 5$ | 5740 |  |  | 61 |  |  |  |  |  |  |
| 54 |  |  |  |  |  |  | 2 |  |  | 46．05 |  | St | S282 | ， |  |  | 683 |  |  |  | 54 <br> 55 |
| 55 | 978 | 9703 | 9620 | 95 | 9453 | 937 | 2 | 9203 | 9119 | 46．90 | $28 \cdot 60$ | 6146 | 6282 | 641 | 655 | 669 | 682 | 69 | 71 |  | 5 |
| 56 | 8328 | 8243 | 815 | 807 | 7988 | 7904 | 7819 | ${ }^{7734}$ | 7649 | 47.756 | $22^{29} 120$ | ${ }^{1348}$ | 1487 | 162 | 176 | 190 | 20 | 2182 |  |  | 56 |
| 57 | 6869 | 63 |  | ${ }^{66}$ | 6524 | 6438 | 6351 | 6265 | 6178 | 48.60 |  | 1753 | 6692 | 20 |  | 23 | 729 |  |  |  |  |
| 58 |  |  |  |  |  | 4972 | 4884 | 4796 | 4708 | 49.46 | 30 | 1753 | 1898 | 204 | 21 | 23 | 24 | 26 |  |  | 58 |
| 59 |  |  |  |  |  |  |  | 3327 | ${ }^{323}$ | 50 |  |  |  |  |  |  |  |  |  |  | 59 |
| 60 | 2494 |  | 2312 | 2221 | 2130 | 2040 | 1949 | 1857 | 1766 | 51．167 | $\frac{31 \cdot 20}{31.720}$ | 215 | 2308 | 2457 | 2606 |  | 2904 | 3053 | 3201 |  |  |
| 61 |  |  |  |  |  | 0574 | 0481 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 957 | 94 | 93 |  |  |  |  |  | ${ }^{88}$ |  |  | 2564 | 2718 | 287 | 30 | 318 |  |  |  |  | 62 |
| 63 | 81 | 85 | 79 | 7832 | 77 | 7641 | 7546 | 7450 | 7355 <br> 5884 | 53.7 <br> 54.57 | ${ }^{32}$ | 776 | 1792 | ${ }_{3288}^{808}$ |  | ${ }^{83}$ |  |  |  |  | 63 |
| 65 |  |  |  |  |  |  |  |  |  |  |  | 1772 | $\begin{array}{\|l\|} 31: \\ 83 \end{array}$ |  |  |  |  |  |  |  | 64 |
| 66 | 374 | 36 | 35 | 3444 | 13344 | 13243 | 143 | 3043 | 2943 | 56．28 | 34．321 | ${ }^{3375}$ | 3539 | 3702 | 3866 | 4030 | 419 | 4358 | 452 | 4685 | 66 |
| 67 |  |  |  |  |  |  |  |  | 1472 |  | 34 ＇84 | 8577 | 8744 |  |  |  |  |  |  |  |  |
| 68 |  | 0723 |  | 0518 | 04 | － | 274 | 0105 | ＋002 | 57．9899 | 35．361 | 13780 | 3949 | 4118 | 42 | 44 | 46 | 4793 |  |  | 9 |
| 69 |  |  |  |  |  | 8845 | 8741 | 8636 | 8531 | 58．8427 | 35•88 | 8983 | 9154 | 932 | 947 | 96 | 98 |  |  |  | 69 |
| 70 | 7909 |  |  |  | 7486 | 7379 | 7273 | 7167 | 706 | 59.69 | 36．40 | 41 | 435 | 45 | 47 | 488 | 5054 | 5228 | 1402 |  |  |
|  |  |  |  |  |  | 59 |  | 5693 | 520 | 1.3 | 371 | 93 | 554 | 919 | 51 |  |  |  |  |  |  |
|  | 493 | 488 | 47 |  | 45 | 44 | 43 | 4229 | 4120 | 61.40 | $37 \cdot 44$ | 45 | 4769 | 494 | 51 |  | 548 |  |  |  | 72 |
| 7 | 35 | 34 | 33 | 32 | 3092 |  | ${ }^{2871}$ | 2760 | 2649 |  |  | 碞 | 5180 | 536315 |  |  | 5915 |  |  | 124 | 73 |
| 74 | 2076 |  |  | 17 |  |  | 1403 |  | 1179 |  |  | 4996 |  |  |  |  |  |  |  |  | 74 |
| $\frac{75}{76}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $\frac{75}{76}$ |
| 76 | 77 | 75 | 89 | ${ }^{83}$ | 7234 | ${ }_{7117}^{8583}$ | $\begin{aligned} & 8468 \\ & 7001 \end{aligned}$ | ${ }_{68}^{83}$ | ${ }^{8237} 67$ |  |  | 5404 | 5795 |  |  |  |  |  |  |  | 77 |
| 78 | 624 | 61 | 6006 | 58 | 57 | 56 | 5533 | 5415 | 529 | 66．517 | 40.56 | 5806 | 600 | 6 | 15 | 658 | 677 | 6968 |  |  | 78 |
| 79 | 478 |  |  | 4425 | 4305 | 4185 |  | 246 | 3826 | 67．3706 | 41.081 | 1009 | 1205 | 140 | 159 |  |  |  | 238 |  | 79 |
| 80 | 3325 | 32 | 30 | 2962 | 2841 | 2719 | 2598 | 2477 | 2355 | 68.2234 | 41.601 | 6212 | 641 | 660 | 680 | 70 | 72 | 74 | 760 | 7800 | 80 |
| 81 | 186 |  | 1622 | 1499 | 13 | 12 | 1130 | 1008 | 0885 |  | 42 | 141 | 162 | 78 | 2018 | 2219 |  |  |  |  |  |
|  | 040 | 02 | 0160 | ． 036 | 9912 | 9781 | 9663 | 9539 | 9414 | 69．92 | 42.64 | 661 | 682 | 70 | 7228 | 743 | 763 |  |  |  | 析 |
| 83 | 7 | 88 | 8699 | 85 | 8447 | 83 | 8195 | 80 | 79 | $70 \cdot 781$ | 43.16 | 182 | 202 | 22 | 2438 | 26 |  |  |  |  | 83 |
| 84 85 88 | 749 | 5964 | 7237 5776 | 56 | 5518 | 5389 | 52 | 513 | 500 | ${ }_{72} 71.688$ |  | ${ }_{22}^{702}$ |  |  |  |  |  |  |  |  | 84 |
| 86 |  | 4444 | 4314 |  | 4054 | 3923 | 372 | 3662 | 3532 | 73 340 | 44.72 | 7428 | 7641 | 7855 | 8068 |  | 8495 |  |  |  |  |
| 87 | 1 | 29 | 28 | 27 | 25 | 2457 | 23 | 2193 | 206 | 74.19 | $45^{\circ}$ | 263 | 284 | 30 | 327 |  | 37 |  | 4142 | 43 | 87 |
| 88 | 165 | 1524 | 139 | 12 |  |  |  | 0724 |  | 75 | 45 |  |  |  | 8888 |  | 8925 |  |  |  |  |
| 89 90 | 0199 | 8605 | 8468 | 8332 | 8196 | 8059 | 792 | 7786 | 7650 | 76.7513 | 46．2814 | 8238 | 8462 | 868 | 8909 | 9132 | 9355 | 9579 | 980 |  | 89 |
| 91 | 7282 |  | 700 | 析 | 6731 |  | ${ }^{6455}$ | 析 | 6179 | ${ }^{77} 60$ | $47^{-3}$ | 344， | 666 | S | 4， |  | 457 |  |  |  |  |
| 92 | 5824 | 56 | 5545 | 5406 | 5267 | 5127 |  | 4848 | 4708 | 78.456 | 47.8415 | 8643 | 887 | 910 | 932 | 9557 | 978 | ． 01 |  |  |  |
|  | 43 | 42 | 4084 | 3943 |  | 36 | 3520 | 3379 | 3238 | $79 \cdot 3097$ | $48 \cdot 3615$ | 3846 | 407 | 430 | 45 | 4770 | 500 | 52 |  |  |  |
|  |  | 1305 |  |  | ${ }^{23}$ |  | 2053 0585 | 1910 | ${ }_{029}^{176}$ | （e）80.1625 <br> 81.0152 | 48.88 | 4251 | 448 | 4723 |  |  |  |  |  |  |  |
| 95 | 14. | 13 |  |  |  |  |  |  |  |  | $49 \cdot 40$ | 4251 |  |  |  | 5195 |  |  | 5902 |  |  |
| 96 | 19990 | 1984 |  | 9554 |  |  |  | ${ }_{7503}^{8972}$ |  |  |  | 9454 | ${ }^{9692}$ |  |  |  | 0646 |  | 122 |  | 96 |
|  | 853 | 83 | 82 |  |  |  |  |  | 735 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5315 |  |  |  |  |  | 441 |  |  |  |  |  |  |  |  |  |  |  |  |
| 100 | 4156 | 4005 | 385 | 202 | 3551 | 339 | 48 | 3096 | 294 | 85．2792 | 52.0016 | 0265 | 0513 | 0761 | 1010 | 1258 | 1506 | 1754 | 2002 | 2251 |  |
|  | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | $37^{\prime}$ | $36^{\prime}$ | $35^{\prime}$ | $34^{4}$ | 33＇ | $32^{\prime}$ | 31 | $40^{\prime}$ | 39 |  | 37＇ | 36 | 35＇ | 34＇ | 33 | 132 | $31^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# TRAVERSE TABLES 

| $31^{\circ}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 820 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 4575 | 5593 | 4588 | 5081 | 5595 | ${ }^{5555}$ |  |  |  |  | S282 |  | 0930 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{6}^{6} 115888$ | $\stackrel{1149}{1674}$ | 1140 | ${ }_{9653}^{1133}$ | ${ }_{3642}^{122}$ | ${ }_{963}^{117}$ | ${ }_{9621}^{1104}$ | ${ }^{1094}$ | ${ }^{1085}$ | ${ }^{5.1098}$ | 3135 | ${ }^{13655}$ | 1380 | 1395 | 509 | ${ }_{6662}^{1424}$ | ${ }_{6679}^{1439}$ | ${ }^{1 / 454} 6$ | ${ }^{1469} 6$ | ${ }^{16831} 6$ |  |
|  |  | ${ }_{8199}^{874} 8$ | ${ }_{8187} 96$ | ${ }_{8175}^{963}$ | ${ }_{8163}^{964}$ | ${ }^{9635}$ | ${ }_{8138}^{9628}$ | 8126 | 8114 |  |  | 1820 | 40 | 1859 | 9 |  | 19 | ${ }^{1939}$ | ${ }_{195}^{1974}$ |  |  |
|  |  | 6724 | 6710 | 6697 | 6683 |  | 6655 | 6642 | 1538 |  |  |  |  | 7092 | 4 | 7136 | 7159 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 112390 | 3774 |  | 3740 |  |  |  |  |  |  |  | 552 |  |  |  |  |  |  |  |  |  |
|  | 2313 | ${ }_{0}^{2293}$ | ${ }^{22804}$ | ${ }^{2282}$ | 0764 | 2226 | ${ }^{2207}$ | 2189 | 2785 |  | 622700 67925 | ${ }_{7957}^{2730}$ | 89 | ${ }_{8022}^{2789}$ | 219 | 2889 | ${ }_{8118}^{2878}$ | 208 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 58 | $13798$ | 3838 | $877 \mid$ |  |  |  |
|  | 174949 | 492 | 4897 | 4871 | 4845 | 4819 |  |  | 472 |  |  |  |  |  | 93 |  |  | 20 | 9162 |  |  |
|  |  |  |  |  |  |  | 1828 | ${ }^{32839} 1$ |  |  |  |  |  | 484 |  |  | 457 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 20 \\ & \hline 21 \\ & 20 \\ & 223 \\ & 23 \\ & 24 \\ & 25 \\ & 26 \\ & 26 \\ & 27 \\ & 28 \end{aligned}$ | 21205954 | ${ }_{7547}^{9023}$ | 79914 | 74 |  | 78 | ${ }_{7380}^{8863}$ | ${ }_{736}^{883}$ | ${ }_{7313}^{879}$ |  |  |  | 90299 | 5113 | \%83 | 225 |  | 519 | ${ }_{5386}^{0141}$ |  |  |
|  | 6107 | ${ }_{6072}^{754}$ | ${ }_{6037}^{7514}$ | ${ }_{6002}^{7480}$ | 5967 | ${ }_{5932}$ | \% 7887 | ${ }_{586}^{736}$ | ${ }_{5827}^{7313}$ | 19 |  | ${ }^{50042}$ | 0289 | O346 | ${ }^{168}$ | ${ }_{0450}^{5222}$ | ${ }_{0517}^{527}$ | 574 |  |  |  |
|  |  | 4597 | 4561 | ${ }_{4}^{4524}$ | 4488 | 4451 | 4414 | 4378 | 4345 |  |  | 5459 | 5519 | 5578 | 538 | 5697 | 5757 | 5815 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{6} 168$ | ${ }^{1647} 1$ | ${ }^{1607}$ |  | ${ }^{1528}$ |  | 248 | 1409 | 138 |  | 135675 | 5914 |  | $\|$6043 <br> 0275 <br> 15 |  | $\begin{array}{\|l\|l\|} 1 / 172 \\ 1009 \end{array}$ |  |  | 6365 |  |  |
|  | 8739 | ${ }_{8697} 8$ | ${ }_{8654}^{031}$ | 86911 | ${ }^{8569}$ | 8526 | 8848 | 8441 | ${ }_{8398} 98$ |  |  | ${ }_{6369} 14$ |  | ${ }_{6508}^{1275}$ | 1577 |  |  | ${ }_{\text {cke }}^{1543}$ | 6855 | ${ }_{6924}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1956 |  |  |  |  |
|  |  |  |  |  |  |  | 518 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{31} 292$ |  | ${ }_{2748}^{424}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 137 | 1321 | 1271 | 122 | 1170 | 1120 | 107 | 1020 | 09 |  | 17.2425 | 206 | 2588 | 267 | 752 | 2834 | 2915 | 997 |  |  |  |
|  |  |  | ${ }_{8318}^{9794}$ |  | 92911 | ${ }_{8}^{263}$ | ${ }^{2987}$ | ${ }^{195}$ | 94 |  |  | 2961 | 181 | ${ }_{3139}$ | ${ }_{322}^{798}$ | 2071 | ${ }_{3}^{8155}$ | 82 |  |  |  |
|  | ${ }^{36} 6950$ | 689 | 6841 | ${ }^{6786}$ | 6731 | 6677 | ${ }^{6622}$ | ${ }^{6567}$ | 6512 |  | 18.8 | 8189 | ${ }^{8278}$ | ${ }^{8367}$ | 8457 | 8546 | 18635 | ${ }^{8724}$ | 8813 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 2114 |  |  |  |  |  | 4065 | 4161 |  | 435 | 4451 |  |  |  |
|  | ${ }^{4} 1056$ | 0995 |  |  |  | 075 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | $4{ }^{4} 5$ |  |  |  | 20 |  |  |  | . 42 | ${ }^{4326}$ | ${ }^{4928}$ | 4529 | 4636 | ${ }^{4733}$ |  |  |  |  |  |
|  |  |  |  |  |  | 7789 |  |  |  |  |  |  |  |  |  |  | +074 |  |  |  |  |
|  | ${ }_{4}^{4} 515$ | 5095 | 5028 |  |  |  | 4760 | 469 | 46 |  | 22 | -009 | ${ }_{0}^{4018}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5794 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 0577 |  |  |  |  |  |  |  |  |
|  | $47{ }^{074}$ | 066 | 0598 | 052 | 0455 | 0383 | 0312 | O240 | 0168 |  |  | 5991 |  | 592 |  | 6157 | ${ }^{6273}$ | 3390 |  |  |  |
|  | 49779 |  |  |  |  |  |  |  | 719 |  |  |  | 626 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5 48 |  | ${ }^{46915}$ | 4 | 3056 | ${ }^{4.59}$ | ${ }^{438}$ | ${ }^{430}$ | ${ }^{4225}$ |  |  |  | 1957 |  |  |  |  | 3591 |  |  |  |
|  | 531899 | 181 |  |  |  |  |  |  | 125 |  |  | 7056 | 7187 | 731 | 7450 |  |  |  |  |  |  |
|  |  | ${ }_{886}^{034}$ | ${ }_{878}^{026}$ | 0 |  | ${ }_{8534}^{8015}$ | ${ }_{8450}^{9933}$ | ${ }_{83}^{98 .}$ | ${ }_{82}^{97}$ |  |  | ${ }_{751}^{223}$ | 764 | 7783 | ${ }_{7928}^{2685}$ | ${ }_{8056}^{2819}$ | ${ }_{8192}^{2952}$ | 328 |  |  |  |
|  | 5674 | 7393 | 7308 | 722 |  | 7052 | 6967 | 6882 | 6796 |  |  | ${ }^{2738}$ |  |  |  | ${ }^{3293}$ | 3432 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8954 |  |  |
|  |  |  |  |  | 46 | 4269 | ${ }_{21}^{402}$ | 34293 | ${ }_{2339}^{3825}$ |  | 违30949 | ${ }^{3193}$ | ${ }_{\text {a }}^{3337}$ | ${ }^{3481}$ |  | 3768 |  |  |  | ${ }^{43433}$ |  |
|  |  | 1493 | 1402 | 1310 |  | 128 | 1036 | 242 |  |  |  | 8220 |  |  | 8094 |  |  |  |  |  |  |
|  | 51.117 | P01 |  |  | ${ }^{9739}$ | 9646 | 1955 |  |  |  |  | 5 |  | d |  | 488 |  |  | 57 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5456 | 5592 | 549 |  |  | 5203 | 5 | 50 | 49 |  |  | 4558 | 47 | 487 | 5034 | 519 | 535 | 551 | 56 |  |  |
|  |  | 4117 |  |  |  |  |  | 3523 |  |  |  |  |  |  |  |  | 10591 |  |  |  |  |
|  |  |  | 1065 | ${ }_{0963}^{244}$ | ${ }^{23461}$ | ${ }^{22450} 0$ | ${ }_{\text {a }}^{21405}$ | 0555 | ${ }_{0}^{19383}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 68979 | 968 | ${ }_{9588}$ | 9485 | 9381 | 9278 | 9174 | 907 | 8967 |  | 35 | ${ }_{5468}^{024}$ | ${ }_{5636} 40$ | 5805 | 5973 | $\begin{gathered} 0905 \\ 60142 \end{gathered}$ | 6310 | 6479 |  | 6816 |  |
|  |  | 821 | 8112 |  |  |  | 7692 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7153 | 5267 |  |  |  | 4834 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 727 | 74 |  |  |  |
|  | - | 288 | 220 | 266 |  | 183 | 027 | 164 | ${ }^{3} 53$ | 62 |  | ${ }^{1605}$ | 786 | 1967 | ${ }_{738}^{214}$ | 7566 |  |  |  |  | 3 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2989 |  |  |  |  |
|  |  |  | \% |  | 544 | 742 | 13 |  | 788 |  |  | 1287 | 270 | 264 | 933 | 8041 | ${ }^{8229}$ | 8418 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 3466 | ${ }_{3345}^{4822}$ |  | 4585 | 2986 | ${ }_{2864}^{4387}$ |  |  |  |  |  |  | 3261 |  |  |  |  |  |  |  |
|  |  |  | 186 |  |  |  |  |  |  |  | ${ }_{4} 4179$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | ${ }_{879}^{026}$ |  |  | ${ }_{841}^{989}$ | ${ }_{829}^{973}$ |  |  | 42-33 |  |  |  |  |  |  | ${ }_{9872}^{4629}$ |  |  |  |
|  | 769 | 7565 | 743 | ${ }^{73}$ | 718 | 7060 | ${ }_{693}^{843}$ | ${ }^{680}$ | ${ }_{6}^{8188}$ |  | ${ }_{43}^{42}$ | ${ }_{\text {a }}^{3880}$ | ${ }_{4}^{8855}$ | 4291 | 4497 | ${ }^{2403}$ | ${ }_{4988}$ | 511 | 53 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{86} 327$ | 3140 | 300 |  |  | 2616 | ${ }^{2888}$ | 235 |  |  |  |  |  |  | ${ }^{202}$ |  |  |  |  |  |  |
|  | ${ }_{88}^{88} 1703$ | 1605 | 1 | 140 | 127 | 1 |  | ${ }^{\text {a }}$ 9386 | 2035 |  |  |  |  | 5221 | 5437 | 5652 | ${ }^{5868} 1108$ |  |  |  |  |
|  | 89 89 | ${ }_{723}^{87}$ |  | 844 |  | ${ }^{173}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | 91590 |  |  | 5487 | 534 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 4289 |  | 4009 |  |  |  |  | 3308 |  |  |  | 1155 | 1383 | $71$ | ${ }_{1839} 18$ |  |  |  |  |  |
|  | $93$ | 2814 |  |  | 238 | 22 |  | 96 | 182 |  |  | 6154 |  |  |  |  |  |  |  |  |  |
|  | (e) | ${ }_{9864}^{1339}$ | 1771 | 957 | 9430 | 285 | 141 | 8989 | ${ }_{8851}^{0337}$ |  | 49.1. |  |  | 7098 |  |  | 788 |  |  |  |  |
|  | 96 | 8389 | ${ }^{8243}{ }^{\text {82 }}$ | 38097 | 7950 | 780 | 7658 | 751 | ${ }^{7365}$ |  |  |  |  |  |  |  |  |  | 350 |  |  |
|  |  |  |  |  |  |  |  |  | 587 |  |  |  |  | 7545 | 778 |  | 326 | 3507 |  |  |  |
|  | 99 4114 |  |  |  |  |  |  | 3059 | 293 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 184 |  |  |  |  |  |  | $52 \cdot 249$ |  |  |  | 349 |  |  |  |  |  |  |
|  |  |  |  |  | ${ }^{266}$ |  | 124 | 123 | $122^{\prime}$ | 21 |  |  |  |  |  |  | $24^{4}$ | 23 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



TRAVERSE TABLES

|  | osine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | ${ }^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 51 | $52{ }^{\prime}$ | $53{ }^{\prime}$ | 54 | $65^{\prime}$ | $56^{\prime}$ | 57 | 58＇ | 59 | $50^{\prime}$ | $51^{\prime}$ | 52＇ | $53^{\prime}$ | 54 | $55^{\prime}$ | 56 | 57 | 58＇ |  |  |
|  | 8496 | 8494 | 8493 | 8491 | 8490 | 84 | 8487 | 8485 | 8484 |  | 275 | 52 | 5279 | 5282 | 5284 | 5287 | 5289 |  |  |  |  |
|  | 699 | 698 | 698 | 6983 | 697 | 69 |  |  |  | $1 \cdot 69$ | 1.0549 | 05 | 055 |  |  | 05 |  |  |  |  |  |
|  | 5488 | 5483 | 5478 | 5474 | 5469 | 54 | 54 | 545 | 545 | 2.54 | $1 \cdot 5824$ | 5831 | 5838 | 5846 | 5853 | 58 | 5868 | 5875 | 5883 | 5890 |  |
|  | 398 | 397 | 3971 |  |  | 39 |  |  | 3934 | 3.39 | 2． 1098 | 11 | 111 | 11 | 113 | 1147 | 1157 | 1167 | 1177 | 1188 |  |
|  | 2479 | 2472 | 2464 | 2456 |  |  |  |  | 2418 | 4.24 |  | 638 | 6397 |  | － | 6434 | 6447 | 645 | 647 |  |  |
|  | 0975 | 0966 | 0957 | 0948 | 0938 | 0929 | 0920 | 0911 | 0901 | 5.0892 | 3.1647 | 1662 | 1677 | 1691 | 1706 | 1721 | 1736 | 175 | 176 |  |  |
|  | 947 | 94 | 9450 | 9439 | 9428 | 9417 | 94 |  | 938 | 537 |  | 69 | 69 | 69 | 6 | 7008 |  | 7043 | 7060 | 707 |  |
|  | 7967 | 79 | 7942 | 7930 | 7918 |  |  |  | 868 | 6.78 | $4 \cdot 2$ | 2216 | 22 | 225 | 22 | 22 | 5 | 2334 | 2354 | 237 |  |
|  | 6463 | 6449 | 6435 | 21 | 6407 | 639 | 63 | 6366 | 6352 | 7.63 | 474 | 7493 | 7515 | 7537 | 75 | 7582 | 7604 | 76 | 7648 | 767 |  |
| 0 | 495 |  |  | 13 | 6187 | 82 | 4866 | 4851 | 36 | ． 4 | $5 \cdot 27$ | 277 | 279 | 281 | 284 | 28 | 28 | 2918 | 2943 | 2967 | 10 |
| 11 | 3454 | 3438 | 3421 | 3404 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 195 | 193 | 191 | 1895 | 1877 | 18 | 18 |  | 182 | 10.17 |  | 33 | 33 |  |  |  |  | 3501 |  |  |  |
| 13 | 044 | 0426 | 04 |  | 0366 | 0346 | 03 | 031 | 0286 | 11. | 6 | 8601 | 863 | 86 | 86 | 87 | 87 | 879 | 88 | 885 | 13 |
|  | 89 | 89 | 880 | 8878 | 8856 | 883 | 88 | 87 | 8770 | 11.87 |  | 3878 | 3912 | 394 |  | 4016 | 4051 | 4085 | 412 | 45 |  |
| 15 | 7438 | 7415 | 7392 | 7369 | 7346 | 7323 | 7300 | 72 | 253 | 1272 | 79118 | 9155 | 9192 | 9229 | 9266 | 9303 | 9340 | 37 | 9414 | 945 | 15 |
| 16 | 593 | 5909 | 5885 | 0 | 5835 | 5811 | 5786 | 5762 | 5737 | 13 | 8．4392 | 443 | 4471 | 4511 | 4550 | 4590 | 4629 | 466 | 4708 | 4748 | 16 |
|  | 443 |  | 43 | 4351 |  | 42 |  |  | 21 | 14.4 | 962 | 9709 | 975 | 979 |  |  |  |  | －002 | 004 | 17 |
| 18 | 29 | 28 | 287 | 2843 | 28 | 2787 | 2760 |  | 04 | 15. | 9．49 | 4986 | 5030 | 507 |  | 51 | 8 | 5252 | 5297 | 534 | 18 |
|  | 14 |  |  | 1334 | 13 | 127 |  |  | 188 | 16.115 | 10.02 | 0262 | 030 | 035 | 0403 | 04 | 04 | 0544 | 05 | 063 | 19 |
| 20 | 99 |  |  | 25 |  |  |  |  | 71 | 16.9640 | 10.5490 | 5539 | 558 | 563 | 56 | 573 | 578 | 83 | 5885 | 5935 | 20 |
| 21 | 8413 | 8381 | 8349 | 8316 | 8284 | 8252 | 8219 |  |  | 17.8122 | 11.0765 | 081 |  |  |  |  |  |  |  |  |  |
| $22$ | 690 | 6875 | 68 |  | 67 | 67 | 670 | 66 | 66 | 18.66 | 11.60 | 6093 |  |  |  |  |  |  |  |  |  |
|  | 540 | 536 | 5334 | 5299 | 52 |  |  |  | 5122 | 19.508 | $12 \cdot 1$ | 137 | 142 | 14 | 15 | 15 | 165 | 17 | 1768 | 182 | 23 |
| 2 | 390 | 3864 | 3827 | 3790 | 3753 | 3716 |  |  |  | $20 \cdot 356$ |  | 664 | 67 | 67 |  | 6884 | 694 | 7003 | 7062 | 711 |  |
| 25 | 2397 | 2358 | 2320 | 2281 | 2243 | 2204 | 2166 | 2128 |  | $21 \cdot 2051$ | 13.1 | 192 | 198 | 2048 | 211 | 217 | 223 | 2295 | 2356 | 2418 | 25 |
| 26 | 0892 | 0852 | 0813 | 0773 | 0733 | 0693 | 0653 | 0613 | 0573 | 22.0533 | 13. | 720 | 7266 | 7330 | 7394 | 7458 | 7522 | 7587 | 7651 | 771 | 26 |
|  | 938 |  |  | 9264 |  |  |  |  | 9056 | 22.901 | 14.24 | 2478 |  | 261 |  |  | 28 | 2878 | 294 | 301 |  |
| 28 | 788 | 78 | 77 | 7755 | 7712 | 7669 | 7626 | 7583 | 7540 | 23 | 14 | 77 | 782 | 789 |  | 8032 | 81 | 817 | 823 |  | 28 |
| 29 | 6380 |  | 62 | 6246 | 62 |  | 6113 |  | 6023 | 24.59 | 15 | 303 | 310 | 31 | 32 | 33 | 339 | 346 | 35 | 360 | 29 |
| 30 | 4876 | 4830 |  | 4 |  |  |  | 455 | 4507 | 25.4461 | 15.823 | 8309 | 838 | 8457 | 8531 | 86 | 868 | 75 | 882 | 8902 | 30 |
| 31 | 3372 | 33 | 32 | 32 | 31 | 3134 |  |  |  | 29 | 16 |  |  |  |  |  |  |  |  |  |  |
|  | 1868 | 18 | 1769 | 1720 | 167 |  | 157 |  | 14 | $27 \cdot 1$ | 16 |  | 894 | 902 |  | 9179 | 92 | 933 | 94 |  | 32 |
|  | 036 | 03 | 0262 | 0211 | 0161 | O1 | 0059 | －008 | 99 | $27 \cdot 99$ | 17.4 | 414 | 42 | 430 |  | 44 | 454 | 462 | 47 | 479 | 33 |
| 34 | 885 | 88 | 8755 | 03 | 8650 | 85 | 854 | 849 | 8441 |  |  | 94 | 95 |  |  | 975 | 983 | 992 | －005 |  |  |
| 35 | 7355 | 730 | 724 | 7194 | 7140 |  |  |  |  | 29 | 18 | 469 | 478 | 48 | 4953 | 50 | 512 | 521 | 5299 | 538 | 35 |
| 36 | 58 | 5796 | 5740 | 5685 | 5630 | 5574 |  |  | 5408 | 30.5353 | 18 | 9971 | 1060 | 014 | 0238 | 0327 | 0416 | 10504 | 0593 | 068 | 36 |
| 3 | 43 | 42 | 42 | 4176 | 4120 | 40 |  |  | 3892 | 31.383 | 19.51 | 5248 | 533 |  |  | 5614 |  | 579 |  |  |  |
| 38 | 284 | 27 | 27 | 2668 | 2609 | 25 | 24 | 2434 | 23 | 32．23 | 20.0 | 05 | 061 |  |  | 09 | 09 | 108 | 118 | 127 |  |
| 39 |  |  |  |  | 1099 | 10 | 09 |  | 085 | 33.07 | $20 \cdot 5$ | 58 | 58 |  |  | 61 | 628 | 638 | 64 | 657 |  |
| 40 | 98 | 9773 | 9712 | 9650 | 9589 |  |  |  |  | 33.9281 | 21.0980 | 1079 | 1178 | 1277 | 1375 | 1474 | 1573 | 167 | 1770 | 186 | 40 |
| 41 | 8330 | 82 | 82 | 81 | 807 | 8015 | 7952 |  |  | $34 \cdot 7763$ | 21．625 |  |  |  |  |  |  |  |  |  |  |
| 42 | 68 | 67 | 66 | 66 | 656 |  |  |  | 6310 | $35 \cdot 6$ |  |  | 1737 |  |  |  |  | 225 | 23 | 246 | 2 |
| 43 | 532 | 52 | 51 | 512 | 5058 |  |  |  | 4793 | $36 \cdot 47$ | 22.68 | 69 | 70 | 71 | 72 | 733 |  | 754 | 765 | 775 | 43 |
| 44 | 381 | 37 | 36 |  | 3548 | 3480 | 34 | 3344 | 327 |  | 23. | 218 | 229 | 240 | 25 | 2622 | 2730 | 83 | 294 | 305 | 4 |
| 45 | 23 | 2245 | 2176 | 2106 | 203 | 1968 | 18 | 18 | 176 | 38.169 | $23 \cdot 7$ | 746 | 757 |  | 779 |  | 801 | 13 | 82 |  | 45 |
| 46 | 08 | 0739 |  |  | 052 | 0456 | 038 |  |  | $39 \cdot 173$ | 24.26 | 2741 | 2854 |  |  |  |  | 3422 |  |  | 46 |
| 47 | 930 | 92 | 9161 | 9089 | 9017 | 89 |  |  | 8727 | 39.865 | 24.79 | 80 | 813 | 8250 |  |  |  | 8714 | 8830 |  |  |
| 48 |  | 77 | 76 |  | 7506 |  |  | 72 |  | 40. | 25 | 32 | 34 | 353 | 36 | 37 | 38 | 400 | 412 | 42 | 48 |
| 49 | 6297 | 622 | 6147 | 6071 | 966 | 5921 | 5845 |  |  | $1 \cdot$ | 25.84 | 85 | 869 | 8814 |  | 90 |  | 929 | 941 |  | 49 |
| 50 | 479 | 471 | 46 | 4563 | 4486 | 09 | 4332 | 425 | 4178 | 42.4101 | 析 | 3849 | 3972 | 4096 | 421 | 4343 | 4466 | 4590 | 4713 | 483 | 50 |
| 51 | 328 | 32 |  |  | 297 |  |  |  | 2662 | $43^{\prime 2} 2883$ | 26.90 | 912 | 25 |  |  | 96 |  | 988 |  |  | 51 |
| 52 |  | 17 |  |  | 146 | 138 |  |  |  | $44 \cdot 10$ | 27 |  |  |  |  | 49 |  |  | 530 |  |  |
| 53 | 028 | 01 | 011 | －0 | 995 | 98 | 97 |  | 9629 | $4 \cdot 95$ | 27 | 968 | 9810 | 994 | －072 | 02 | 4 | 0465 | 050 |  | 3 |
| 54 | 877 | 86 | 86 |  | 844 | 83 |  |  | 81 | $45 \cdot 8029$ |  | 49 | 50 | 52 | 53 | 54 | 56 | 575 | 589 | 60 | 54 |
| 55 | 72 | 7188 | 7103 | 7019 | 6934 | 6850 | 67 |  | 65 | 46.651 | 29.00 | 023 | 036 | 050 |  | 077 | 0913 | 104 | 118 | 132 | 55 |
| 56 | 57 | 5682 | 5596 | 5510 |  |  | 5252 |  |  | $47 \cdot 4993$ | 29.53 |  |  |  |  | 6064 |  |  |  |  |  |
| 57 | 426 | 4177 | 4089 | 40 | 3914 | 3826 | 373 |  | 3563 | 48.3475 | 30.06 |  | 092 | 106 |  |  |  | 1632 | 1773 |  |  |
| 58 | 27 | 267 | 2582 |  | 2404 | 2314 | 222 | 21 |  | 49＇1957 | $30 \cdot 5$ |  |  | 63 |  | 66 |  |  | 706 | 72 |  |
| 5 | 125 | 11 | 1075 | 84 | 0893 | 803 | 0712 | 062 |  | 50．0439 | 31.11 | 134 | 148 | 163 | 177 |  |  | 221 | 236 |  |  |
| 60 | 975 | 96 | 95 | 94 | 9383 | 9291 | 9198 | 9106 | 9014 | 50．8921 | 31.64 | 6618 | 676 | 6915 | 7063 |  | 73 | 750 | 765 | 780 | 60 |
| 61 | 82 |  |  |  |  |  |  |  |  |  | $32 \cdot 17$ |  | 2046 | 219 | 23 | 24 | 析 |  | 950 |  |  |
|  |  |  |  |  | 6362 |  |  |  |  | 52.58 | 32．70 |  |  |  |  |  |  |  |  |  |  |
| 63 | 523 | 51 | 50 | 49 | 4852 | 475 | 46 | 45 | 446 | $53 \cdot 43$ | 33．20 |  |  |  |  |  |  |  |  |  |  |
| 64 |  | 36 |  |  | 3342 | 3243 | 314 | 30 | 29 | 54．2849 | $33 \cdot 7$ |  |  | 804 |  | 83 | 85 |  | 883 |  |  |
| 65 | 223 |  |  |  | 1832 | 1732 |  |  |  | $55 \cdot 1331$ | 34．2 |  |  |  | 34 | － | 380 |  | 412 | 428 | 65 |
| 66 | 07 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
| 67 | 922 | 9120 | 90 | 8914 | 881 |  |  |  | 839 | 56.8295 | 35.33 | 35 | 37 | 388 |  | 421 | 438 | 455 | 421 |  |  |
|  |  |  |  |  |  |  | 7092 | 69 | 6882 | 57.6777 | 35•86 | 883 | 900 | 917 |  |  |  | 981 | 101 | 017 |  |
| 69 | 621 | 610 | 60 | 5897 |  | 5684 | 5578 | 547 | 536 | 50.52 |  | 4111 | 12 | 445 |  |  |  | 51 |  |  | 69 |
| 70 | 47 | 460 | 44 | 43 | 4280 | 417 | 406 | 395 | 384 | 59.374 | $36 \cdot 92$ | 938 | 956 | 973 | 990 | －08 | 025 | 042 | 0598 | 077 | 70 |
| 72 | 3206 | 3097 |  | 28 | 2770 |  | 255 | 242 | 2333 | 60 | $37 \cdot 44$ |  | 484 | 501 |  |  | 55 | 571 | 589 | 606 | 71 |
| 72 |  |  |  |  |  |  |  |  | 0816 | 61. |  |  |  | 029 | 047 | 065 |  | 103 | 178 | 136 | 72 |
| 73 | 019 | 1086 | 997 | 9862 | 9749 | 9637 | 9525 | 941 | 9300 | 61.91 | $38 \cdot 50$ | 52 | 539 | 558 | 576 | 594 | 612 | 630 | 648 | 666 | 73 |
| 74 |  |  |  |  | 8 | 8125 | 8011 |  | 7784 | $62 \cdot 767$ | 39.031 | 0496 | 067 | 086 | 104 | 122 | 141 | 159 | 177 | 195 | 74 |
| 75 | 7190 | 7074 |  |  | 6729 | 6613 | 6498 |  |  | 63.615 |  | 577 |  | 614 | 6320 | 651 |  | 6884 |  | 725 | 75 |
| 76 | 5685 | 5569 |  |  |  |  |  |  |  |  |  |  |  |  |  | 砣 |  |  |  |  | 76 |
| 77 | 418 | 406 | 39 | 382 | 3708 | 35 | 3471 | 335 | 3234 | $65 \cdot 31$ | 40.61 | 632 | 651 | 670 | 689 | 708 | 727 | 746 | 76 | 7848 | 77 |
| 7 | 2617 | 1052 |  | 2189 |  | 2078 | 1958 | －323 | 1718 | 66.1598 | 41.14 | 1604 | 179 | 1989 | 2182 | 237 | 256 | 276 | 295 | 314 | 78 |
| 79 | 1173 | 1052 | 0930 | 0809 | 0688 | 0566 | 0445 | 0323 | 0201 | 67.0080 | 41.66 | 688 | 7076 | 7271 | 746 | 766 | 785 |  | 824 |  | 79 |
| 80 | ¢ | 9546 | 9423 | 9300 | 1 | 9054 | 893 | 8808 | 868 | 67－8562 | $42 \cdot 196$ | 215 | 235 | 255 | 275 | 2948 | 314 | 334 | 354 | 373 | 80 |
| 81 | 81 |  | 7916 |  | 7667 | 7542 | 7418 | 293 | 7169 | 68.7044 | $42 \cdot 723$ | 7435 | 7635 | 783 | 803 | 823 | 843 | 863 | 883 | 903 | 81 |
| 82 | 666 515 | 65 | 640 | 628 | 615 | 651 | 5905 | 578 | 5652 | 69.552 | 43.250 | 271 | 291 | 311 | 331 | 352 | 372 | 3927 | 412 |  | 82 |
| 83 | 5156 | 50 | 490 | 4774 | 4647 | 4519 | 4391 | 4263 | 4136 | 70．4008 | 437788 | 7989 | 8194 | 8399 | 8604 | 880 | 901 | 921 | 9423 | 962 | 帾 |
|  | 565 | 523 | 103 | 1725 | 3136 | 3007 | 2878 | 2749 | 2619 | $71 \cdot 2490$ | $44 \cdot 305$ | 326 | 3473 | 368 | 388 | 4096 | 430 | 451 | 4718 | 492 | 84 |
|  | 214 | 201 | 188 | 1757 | 1626 | 149 | 1364 | 123 |  | 72.0972 |  |  | 875 | 368 | 981 | 4038 | 仡 |  | d | 428 | 85 |
| 86 | 06 | 0512 | 038 | 0248 | －1 | 9983 | 9851 | 9719 | 078 |  |  |  | 仡 | 424 |  | 傀 | 481 |  |  |  | 86 |
|  | 9140 | 㖪 | 8873 | 8739 | 8605 | 72 | 8338 | 8204 | 8070 | 73.7936 | $45 \cdot 88$ | 90 | 931 | 952 | 974 | 995 | 11 | 038 | 060 |  | 87 |
| 88 | 7636 | 7501 | 7366 | 7230 | 7095 | 5960 | 6824 | 6689 | 6553 | 74.6418 | $46^{\circ} 4$ | 4374 | 4591 | 4808 | 5026 | 524 | 546 | 567 | 析 | 611 | 88 |
| 89 | 6132 | 5995 | 5858 | 5722 | 5585 | 5448 | 5311 | 5174 | 5037 | $75 \% 4900$ | 46.943 | 965 | 9870 | ＋090 | 0310 | 053 | 075 | 096 | 118 |  | 89 |
| 80 | 4627 |  | 4351 | 4213 | 4075 | 3936 | 3798 | 3659 | 3521 | 76.3382 | 47.470 | 492 | 5150 | 5372 | 559 | 581 | 60 | 62 | 648 | 670 | 90 |
| 91 | 3123 | 298 | 2844 | 1104 | 1054 | 2424 | 287 |  |  | － |  |  |  |  |  |  | 132 | 155 |  |  |  |
|  | 1619 | 147 | 1337 | 1195 | 1054 | 0912 | 0771 | 0629 | 0488 | 78.034 | 48525 | 548 | 57 | 593 | 616 | 639 | 66 | 68 | 仡 |  | 92 |
| 93 | －11 | 997 | 982 | 9687 | 544 | 9401 | 9258 | 9114 | 897 | 78.882 | 49.052 | 0758 | 09 | 1218 | 1448 | 1677 | 190 | 213 | 236 | 25 | 93 |
| 94 | 861 | 846 | 832 | 8178 | 8033 | 7889 | 7744 | 7600 | 455 | 797310 | 5803 | 6035 | 6268 | 6500 | 6732 | 696 | 7196 | 742 | 7660 | 矿 | 94 |
| 95 | 71 | 6961 | 6815 | 6669 | 6523 | 6377 | 6231 | 6085 | 5938 | 80＇5792 | 50\％i078 | 1312 | 1547 | 1782 | 2016 | 225 | 2486 | 2720 | 5 |  | 95 |
|  | 5603 | 5455 | 308 |  |  | 65 | 4718 | 4570 | 4422 | 81.427 | 50.635 | 658 | 6827 | 7064 | 30 | 7538 | 777 | 801 | 824 |  | 96 |
| 97 | 40 | 39 | 38 | 365 | 15 | 3353 | 3204 | 3055 | ， | $82 \cdot 275$ | 51.162 | 1866 | 2106 | 2346 | 258 | 2825 | 3064 | 330 | 35 | 378 | 97 |
| 98 | 2594 | 2444 | 2293 | 2143 | 1992 | 1842 | 169 | 1540 | 1389 | 83.12 | 51.6901 | 714 | 738 | 76 | 787 | 81 | 8354 | 8595 | 88 | 位 | 98 |
|  |  | 仡 | 927 | 0634 | 0482 | 0330 | 0177 | －025 | 9873 | 83.97 | 52.2176 | 2420 | 2665 | 2909 | 3154 | 3398 | 3643 | 3887 | 4 | 437 | 99 |
| 100 | 9586 | 9433 | 9279 | 9125 | 8972 | 8818 | 8664 | 8510 | 8356 | $4 \cdot 82$ | 52.7450 | 7697 | 944 | 191 | 8438 | 68 | 932 | 9179 | 426 | 573 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$｜ |  |  |  |  |  |  | $5^{\prime}$｜ |  |  |  |  |  |
| 58 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $32^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $32^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | ${ }^{\prime}$ | $2^{\prime}$ | $3^{\prime}$ | $4^{\prime}$ | $5^{\prime}$ | $6^{\prime}$ | 7 | 8 | 9 | $0^{\prime}$ | ${ }^{\prime}$ | 2 | $3^{\prime}$ | $4^{\prime} 1$ | $5^{\prime}$ | $6^{\prime}$ | $7^{\prime}$ | 8 | 9 |  |
|  | 84 | 84 | 8477 | 8476 | 84 | 8473 | 8471 | 8470 | 8468 | 8467 | 5299 | 5302 | 5304 | 530 | 530 | 5312 | 5314 | 5316 | 19 | 5321 |  |
|  | 6961 | 695 | 655 | 695 | 694 | 69 | 6942 | 6939 |  | $\cdot 69$ | 1.05 | 0603 | 0608 | 061 | 061 | 062 | 062 | 063 | 0638 |  |  |
|  | 5441 | 5437 | 5432 | 5428 | 5423 | 5418 | 54 | 5409 | 5404 | $2 \cdot 540$ | － 5 | 5905 | 5912 | 5920 | 5927 | 593 | 594 | 5949 | 5957 |  |  |
| 4 | 3922 | 3916 | 3910 | 3903 | 3897 | 389 | 388 | 3879 | 3873 |  | 1197 | 1207 | 1217 | 1226 | 1236 | 124 | 125 | 1266 | 127 |  |  |
| 5 | 2402 | 2395 | 2 | 2379 | 2372 | 2364 | 2356 | 2348 | 341 | －2333 | 96 | 08 | － 6521 | 6533 | 654 | 6558 | 6570 | ｜ | 6595 | 6607 |  |
| 6 | 0883 | 087 | 0864 | 0855 | 0846 |  |  |  | 0809 |  | 3.1795 | 1810 | 1825 | 1840 | 1854 | 1869 | 1884 |  | 1913 |  |  |
|  | 936 |  |  |  |  |  |  |  | 9277 |  |  | 7112 | 729 | 保 | 7163 | 718 | 719 | 253 | 232 |  |  |
|  | 784 | 783 | 78 | 78 | 77 | 7782 | 7170 | 7757 | 7745 | 773 | 23 | 241 | 2433 | 2453 | 2472 | 249 | 2512 | 253 | 2551 | 257 |  |
|  | 6324 |  |  |  |  |  |  |  | 6213 |  | 769 | 7715 | 7737 | 7759 | 7782 | 78 | 71 | 7848 | 70 | 7892 |  |
| 10 | 480 | 47 | 47 | 4759 | 43 | 28 | 4712 | 4697 | 4681 | 8.4666 | 2992 | 3017 | 30 | 3066 | 309 | 311 | 3140 | 316 | 318 | 3214 | 10 |
| 11 | 32 | 3268 | 3251 | 3234 | 3217 | 3200 | 3183 | 316 | 3149 | 9．313 | $5 \cdot 829$ | 83 | 834 | 8373 | 8400 | 84 | 8454 | 8481 | 8508 | 853 | 11 |
| 12 | 17 |  |  | 1710 | 1692 | 167 |  |  | 1618 | $10 \cdot 15$ | 3590 | 36 |  |  | ， | 37 |  | 3797 |  |  | 12 |
| 13 | 02 |  |  |  | 0166 | O14 | 0126 |  |  | 11.006 |  |  |  | 898 | 9018 | 9050 |  | 114 | 9146 |  | 13 |
| 14 | 872 | 87 | 8684 | 8662 | 8640 | 8619 | 859 | 8575 | 855 | 11 | 4189 | 42 | 4258 | 42 | 432 | 4361 | 439 | 4430 | 4465 |  | 14 |
| 15 | 720 |  |  |  |  |  |  |  |  |  |  |  |  |  | 963 | 9673 | 9710 |  | 9784 | 9821 | 15 |
| 16 | 56 | 5663 |  |  |  |  |  |  | 5490 | 13.546 | 8.4787 | 4827 | 4866 | 4905 | 4945 | 4984 | 5024 | 5063 | 5103 | 5142 | 16 |
| 17 | 416 | 414 | 4116 |  | 4063 |  | 4 | 3984 | 3958 | 14.3 | 9.0086 | 01 | 01 | 02 | 02 | 02 | 03 | 0380 | 22 |  | 17 |
| 18 | 26 | 26 |  |  | 2538 | 2510 | 2482 |  | 2426 | 15 | 9.5385 |  | 54 | 55 | 556 | 56 | 56 |  | 5740 |  | 18 |
| 19 | 11 |  |  |  | 1012 | 0983 | 0953 |  | 0894 | 16.08 | 10.068 |  |  | 0825 | 87 | 0919 | 096 | 1013 | 1059 | 1106 | 19 |
| 20 | 9610 | 957 | 9548 | 17 | 9486 | 9455 | 9424 | 9393 | 9363 | $16^{\circ} 9$ | 10.59 | 60 | 608 | 6132 | 6181 | 623 | 62 | 632 | 637 | 6428 | 20 |
| 21 | 808 | 80 | 802 | 799 | 7960 | 7928 | 7896 | 7863 | 783 | 17 | 11. | 1335 | 1387 | 1438 | 1490 | 1542 |  | 1645 | 1697 | 1749 | 21 |
| 22 | 65 |  |  |  |  | 6401 | 636 |  | 62 | 18.6265 | 11 |  |  | 6745 | 6799 | 68 |  |  |  |  | 22 |
| 23 | 505 | 50 | 49 | 4945 | 49 | 4874 | 4838 | 4802 | 476 | 19.4731 | 12 | 193 | 19 | 20 | 210 | 216 | 22 | 2278 | 2335 | 2392 | 23 |
| 24 | 35 | 34 | 34 | 3420 | 3383 | 3346 |  |  | 3235 | 20.3198 | 12 |  |  |  | 741 | 747 |  |  |  |  | 24 |
| 25 | 2012 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 |
| 26 | 049 |  |  |  |  | 0292 | 0252 |  | 0171 | 22.0131 | 13.7779 | 7843 | 790 | 7971 | 8035 | 8100 | 8164 | 22 | 329 |  | 26 |
| 27 | 897 | 89 | 8890 | 8848 | 8806 | 876 | 872 | 8681 | 8639 |  | 14 | 3145 | 3211 | 3278 | 3345 | 34 |  | 354 |  |  | 27 |
| 28 | 74 |  |  |  |  | 7237 |  |  |  | 706 | 14 |  | 8516 | 8585 | 865 | 87 | 8792 |  | 3930 |  | 28 |
| 29 | 593 | 58 |  |  | 57 | 5710 | 5665 | 5621 | 5576 | 24.5 | 15.3 | 3748 | 20 | 3891 | 39 | 40 | 410 | 417 | 48 | 432 | 29 |
| 30 | 441 | 436 | 432 | 4276 | 42 | 18 | 4137 | 4090 | 4044 | $25 \cdot 3997$ | 15.89 | 9050 | 9124 | 9198 | 927 | 934 | 9420 | 9494 | 9567 |  | 30 |
| 31 | 2895 | 2847 | 2799 | 2751 | 2704 | 2656 | 2608 | 2560 |  | 26.2464 | 16.4275 |  | 4428 | 4504 | 4581 | 4657 | 4734 | 4810 | 4886 |  | 31 |
| 32 |  |  |  |  | 1178 | 1128 |  |  |  | 27.0931 | 16.9574 |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 985 | 98 | 97 | 9703 | 9652 | 9601 | 9550 | 9499 | 9448 | $27 \cdot 9397$ | 17 |  |  | 5118 | 5199 | 52 | 5362 | 5443 | 5524 |  | 33 |
| 34 | 83 |  | 82 |  | 8127 | 8074 |  |  |  | $28^{\prime} 7864$ | 18.0173 | 0256 | 0340 | 04 |  | 05 | 067 | 759 |  |  | 34 |
| 35 | 68 |  | 6709 |  |  |  |  |  |  |  | 18 |  |  | 573 | 581 | 59 | 599 | 6076 |  |  | 35 |
| 36 | 5297 | 5242 |  |  |  |  |  |  |  | 30479 | 19 | 0860 | 0949 | 10 | 11 | 12 | 13 | 1392 |  |  | 36 |
| 37 | 377 | 3721 |  |  |  |  | 343 |  |  | $31 \cdot 3263$ | 19．6070 |  |  | 636 |  | 65 |  |  |  |  | 37 |
| 38 | 225 | 22 |  |  | 24 |  |  |  |  | 32 | 20．1369 |  |  | 1650 |  | 18 |  |  |  |  | 8 |
| 39 | 073 | 06 |  | 0558 | 98 | 0438 | 0378 | 031 | 0257 | 33 | 20.6669 |  |  |  | 705 | 71 | 7245 |  | 738 |  | 39 |
| 40 | 9219 | 91 | 9096 | 9034 | 72 | 8911 | 8849 | 8787 | 872 | 33．8663 | 21．19 | 2066 | 2165 | 2264 | 2362 | 2461 | 2559 | 2658 | 2757 | 285 | 40 |
| 41 | 7700 | 7636 | 7573 |  |  |  |  |  |  |  | 21 ＇7267 |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 618 |  |  |  | 5921 |  |  |  |  | 34． | 22.25 |  |  | 287 | 298 | 30 |  |  | 394 |  | 42 |
| 43 | 46 | 45 | 4528 | 4462 | 995 | 4329 | 42 | 41 | 4129 | 36 | 22 |  | 8077 | 8183 | 82 |  |  |  | 8713 |  | 43 |
| 44 | 314 | 30 |  | 2938 |  | 2802 |  |  |  | 37.25 | 23 | 3273 |  |  | 3599 |  |  |  | 032 |  | 4 |
| 45 | 162 | 155 |  |  | 1344 | 127 |  | 113 |  | 38.099 | 23.84 | 8575 |  | 879 | 89 | 901 | 912 | 2240 | 35 |  | 45 |
| 46 | 010 | ＋031 |  |  | 9818 |  |  |  |  |  | $24 \cdot 37$ |  |  |  |  | 4330 | 4443 |  |  |  | 46 |
| 47 | 85 | 851 | 8438 | 8365 | 8293 |  |  |  |  |  | 24 | 9178 |  | 9410 |  |  |  |  |  |  | 47 |
| 48 | 70 |  |  |  | 6767 |  |  |  |  | 40 | 25 | 4480 | 45 | 47 | 483 | 495 | 5071 | 5190 | 5308 |  | 48 |
| 49 | 554 |  |  |  |  |  |  |  |  |  | 25 |  |  | ${ }^{1}$ |  |  | 0385 |  |  |  | 49 |
| 50 | 4024 | 39 | 3870 | 3793 | 3715 | 3638 | 3561 | 3484 | 3406 | 42 | 26.4960 | 5083 | 5206 | 5330 | 5453 | 5576 | 5699 | 5823 | 5946 | 6060 | 0 |
| 51 | 2505 |  |  |  | 2190 | 211 | 203 |  |  | $43 \cdot 1796$ | 27.0259 |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 09 |  | 0825 | 0744 | 0664 | 058 | 0503 |  |  | 44：02 | ， |  |  |  |  | 61 | 6327 |  |  |  | 52 |
| 53 | 94 |  |  |  | 9138 |  |  |  |  | $44 \cdot 87$ | 28.0857 |  |  |  | 13 | 15 |  |  |  |  | 53 |
| 54 | 79 | 7863 |  | 7696 | 7613 | 7529 | 744 |  | 7279 | 45 | 28. | 62 |  | 65 |  | 682 | 695 | 708 | 7221 |  | 54 |
| 55 | 642 | 63 | 6257 |  |  |  | 59 |  |  | 46.5662 | $29 \cdot$ |  |  |  |  | 2134 | 226 |  |  |  | 55 |
| 56 | 490 |  |  |  |  |  |  |  |  |  | 29.67 |  |  |  |  |  |  |  |  |  | 5 |
| 57 | 338 |  |  |  | 3036 |  |  |  | 2683 | 48.259 | 30.2 |  |  | 2476 |  |  | 2897 |  |  |  |  |
| 58 | 186 | 17 | 1689 | 1599 | 15 | 1420 | 133 | 124 | 115 | $49 \cdot 106$ | 30.73 |  | 763 | 77 |  |  | 8211 |  |  | 86 | 58 |
| 59 | 03 |  |  |  |  |  |  |  |  | ． 95 |  |  |  | 30 |  | 338 | 52 |  |  |  | 59 |
| 60 | 88 | 8736 | 8644 | 8551 | 8459 | 836 | 8273 | 8180 | 88 | 50．7995 | 31.7 | 00 | 24 | 839 | 854 |  | 883 | 898 | 13 |  |  |
|  | 7309 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 579 | 56 |  |  |  |  |  |  |  |  | 32 |  |  |  |  |  |  |  |  |  | 62 |
| 63 | 4270 |  |  |  |  |  |  |  |  | ．33 | 33．38 |  |  |  |  |  |  |  |  |  |  |
| 64 | 2751 | 2652 | 2553 | 24 | 23 | 2257 | 215 | 2059 | 1960 | 54.186 | 33.9148 |  | 94 | 962 | 97 |  | ＋095 |  | 0410 |  | 64 |
| 65 | 123 | 1131 |  |  |  |  |  |  |  | －032 | 34．4448 |  |  | 4928 | 5089 | 5249 |  |  | 57 | 58 | 65 |
| 66 | 97 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
|  |  |  |  |  |  |  |  |  |  | 56.72 |  |  |  |  |  | S |  |  |  |  | 67 |
| 68 | 667 | 65 | 6463 | 6358 | 62 | 61 | 6043 | 5938 | 583 | $57 \cdot 57$ | 36.03 |  | 068 |  | 1016 |  | 136 |  | 168 |  | 68 |
| 69 |  |  |  |  |  |  |  |  | 析 | 58．419 |  | 5814 | 59 | ， |  |  | 665 |  |  |  | 69 |
| 70 | 36 | 3526 | 3418 | 10 | 202 | 3094 | 2985 | 2877 | 2769 | ． 26 | $37 \cdot 09$ | 1116 | 128 | 14 | 163 | 1806 | 197 | 215 | 232 | 249 | 70 |
| 71 |  |  |  | 1786 | 1676 | 1566 | 1457 | 1347 | 1237 |  | 37．62 | 641 | 659 | 67 | 69 | 1830 |  |  | 研 |  | 71 |
| 72 | 05 | 04 | 0373 | 0261 | 0150 | －039 | 9928 | 析 | 9705 | 60．95 | 38．15 | 1719 | 1897 | 73 | 2252 | 2430 | 260 | 2784 | 2 |  | 72 |
| 73 |  |  |  |  |  |  |  | 8286 |  | ＇8069 | $38^{\circ}$ | 7021 | 725 | 73 | 7561 | 774 | 792 | 810 |  |  | 73 |
| 74 | 75 | 7441 | 7327 | 13 | 7099 | 6985 | 6870 | 6756 | 6641 | $62 \cdot 65$ | 39.2140 | 2323 | 25 | 26 | 2870 | 3053 | 3235 | 341 | 36 |  | 74 |
| 75 | 60 | 20 |  |  |  |  |  | 5225 |  |  | 39.7439 |  |  |  |  |  |  |  |  |  | 75 |
| 76 | 451 |  |  |  |  |  |  |  |  |  | 40.27 |  |  |  |  |  |  |  |  |  |  |
| 78 |  |  |  |  | 2522 | 2403 | 84 | 2165 | 2046 | 65192 | 40：803 | 82 | 84 | 86 |  | 898 |  |  | 95 |  | 77 |
| 78 | 147 | 1357 | 1237 | 1117 | 0996 | 0876 | 0755 | 0634 | 051 | 66.039 | 41．33 | 352 | 372 | 硡 | 4106 |  | 449 |  |  |  | 78 |
| 79 |  |  |  |  |  |  | 9226 | 9104 |  | $66 \cdot 886$ | $11 \cdot 8$ | 883 | 仡 | 922 | 9416 | 961 | 980 |  |  |  | 79 |
| 80 | 8438 | 15 | 92 | 806 | 7945 | 7821 | 7698 | 7574 | 7450 | 67．7326 | $42 \cdot 39$ | 4133 | 433 | 4527 | 472 | 4922 | 51 | 5316 | 5513 | 571 | 80 |
| 81 | 6919 | 6794 | 6669 | 654 | 6419 | 629 | 6169 | 6044 | ， | 68.579 | 42.923 | 9434 | 9634 | 983 | ．034 | 223 | 573 |  | 0832 |  | 81 |
| 1 |  | 保 |  |  |  |  |  | ， | 源 |  |  | 238 | 4938 | 514 | 5343 | 535 | Stir |  | 析 |  |  |
| 83 | 580 | 3752 | 3624 | 3496 | 3368 | 3239 | 3111 | 2983 | 2854 | 70.272 | 43.9833 | ＋03 | 0242 | 044 | 065 | 085 | 106 | 126 | 147 | 1 | 83 |
| 84 | 2360 | 22 | 2101 | 1972 | 342 | 1712 | 1582 | 1453 | 1323 |  | 44.513 | 533 | 554 | 575 | 596 | 6168 | 637 | 558 | 678 |  | 84 |
| 85 | 0841 |  |  |  |  | 0185 | t054 | 9922 | 979 | 71.9659 | 45.043 | 064 | 085 | 106 | 127 |  | 168 | 189 |  |  | 85 |
| 86 | 9321 | 91 | 9056 |  | 8791 | 86 | 8525 | 392 | 825 | 72.81 | 45．573 | 59 | 6155 | 6367 | 6579 | 6791 | 700 | 721 | 7427 |  | 86 |
| 87 | 7802 | 7668 | 753 | 7399 | 65 | 7131 | 6996 | 6862 | 6727 | $73 \cdot 65$ | $46 \cdot 10$ | 12 | 1459 | 1673 | 1888 | 210 | 231 |  | 27 |  | 87 |
| 88 | 6282 | 614 | 6011 |  | 5739 |  | 5678 | 5331 | 5195 | 74.50 | 46.63 | 65 | 67 | 698 | 7197 | 741 | 763 | 8， |  | 828 | 88 |
| 89 | 4763 | 4626 | 4488 | 4351 | 4214 | 4076 | 938 | 3801 | 366 | $75 \cdot 35$ | $47 \cdot 162$ | 18 | 2067 | 228 | 2506 | 272 | 294 | 316 | 338 | 36 | 89 |
| 90 | 3243 | 3105 | 2966 | 2827 | 2688 | 2549 | 2410 | 2271 | 2131 | 6．199 | 47－6927 | 714 | 7371 | 7593 | 7815 | 8037 | 8259 | 848 | 870 | 992 | 90 |
| 91 | 1724 | 1583 |  |  |  |  |  | 120 |  |  |  |  | 7975 | 硣 |  |  |  |  |  |  |  |
| 92 | 0204 | ＋062 | 2 | 258 | 9636 | 494 | 疗 | 9210 | 906 | 77－892 | 48.75 | 77 | 798 | 820 | 843 | 8660 | 888 | 911 | 9340 |  | 92 |
| 93 | 868 | 854 | 839 | 8254 | 8111 | 7967 | 7823 | 680 | 75 | $78 \cdot 739$ | 49.28 | 3054 | 3284 | 351 | 374 | 397 | 420 | 4430 |  | 48 | 93 |
| 94 | 7165 | 720 | 687 | 矿 | 811 | 6440 | 6295 | 6149 | 6004 | 79.5858 | 498124 | 8356 | 8588 | 8820 | 9051 | 9283 | 951 | 974 | 硣 |  | 94 |
| 95 | 5646 | 5499 | 5353 | 5206 | 5059 | 4913 | 4766 | 4619 | 4472 | $80 \cdot 4325$ | $50 \cdot 3423$ | 365 | 3892 | 4126 | 360 | 459 | 482 | 50 | 5297 | 55 | 95 |
| 96 | 4126 | 3978 | 30 | 3682 | 34 | ${ }^{3385}$ | 3237 | ${ }^{3089}$ | 2940 | ｜81－2792 | 50.872 | 8959 | 9196 | 9433 | 9669 | 906 | 14 | 0379 | 0616 | 085 | 96 |
|  | 2607 | 2457 | 08 | 58 | 2008 | 1858 | 1708 | 1558 | 1408 | 22 | 51＇4022 | 4261 | 4500 | 4739 | 4979 | 521 | 5457 | 569 | 5935 |  |  |
|  | 1087 | 093 |  | 0634 | 0482 | 0331 | 017 | ． 02 | 987 | 82 | 51.93 | 956 | 9804 | ＋046 | 028 | 05 | 077 |  | 1253 |  | 98 |
|  | 9568 | 9415 | 9262 | 9109 | 8957 | 8804 | 8651 | 8498 | 8344 | 83.8191 | 52.4620 | 4864 | 5108 | 5353 | 5597 | 584 | 6085 | 632 | 6572 | 6816 | 99 |
| 100 | 48 | 7894 | 7740 | 7585 | 7431 | 7277 | 122 | 996 | 6813 | $84^{\circ} 6658$ | 52.9919 | 16 | 0413 | 0659 | 0906 | 1152 | 1399 | 1645 | 1891 | 2138 | 100 |
|  | $60^{\prime}$ | 59. | $58^{\prime}$ | 57 | $56^{\prime}$ | $55^{\prime}$ | $54^{\prime}$ | 53 | 52 | 51 |  |  |  | 57 | 56 | 55 | 54 | $53^{\prime}$ | $52^{\prime}$ | $51^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | IN |  |  |  |  |  |

TRAVERSE TABLES．

| $32^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $32^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 10 | 11 | $12{ }^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | 16 | 17 | 18 | $19^{\prime}$ | $10^{\prime}$ | $1{ }^{\prime}$ | 12 | $13^{\prime}$ | $14^{\prime}$ | 15 | 16 | 17 | $18{ }^{\prime}$ |  |  |
|  | 8465 | 8463 | 84 | 846 | 84 | 84 | 8456 | 8456 | 8453 | ． 845 | 5324 | 53 | 5329 | 5331 | 34 | 5336 | 5339 | 41 | 4， | 5346 |  |
|  | 6930 | 6927 | 6924 | 69 | 69 | 69 | 691 |  |  | de | 0648 | 06 | 06 |  |  | 06 | 0677 | 062 |  |  |  |
| 3 | 5395 | 5390 | 5386 | 538 | 5376 | 5372 | 5367 | 5363 | 53 | ． 5 |  | 5979 | 5986 | 59 |  | 6008 | 6016 | 5023 | 6031 | ， |  |
|  | 3860 | 3854 | 3848 | 3842 | 3835 | 3829 | 3823 | 3817 | 3810 | 38 | 7295 | 130 | 1315 | 1325 | 1335 | 1345 | 1354 | 1364 | 1374 |  |  |
| 5 | 2325 | 2317 | 2310 | 2302 | 2294 | 2286 | 79 | 2271 | 22 | －225 | 19 | 6632 |  | 6656 | 6668 | 6681 | 65 | 6705 | 6718 |  |  |
| 6 | 0790 | 0781 | 0772 | 0762 | 0753 | 0744 | 0734 | 0725 | 0716 | 5.070 | $3 \cdot 1943$ | 1958 | 1973 | 1987 | 2002 | 2017 | 2032 | 2046 | 2061 |  |  |
| 7 | 25 | 924 | 9234 |  | 9212 |  |  |  | 9 |  |  | 28 |  |  |  | 7353 | 737 | 38 | 7405 | 42 |  |
| 8 | 7720 | 7708 | 7695 | 7683 | 7671 | 7658 | 7646 |  | 76 |  | 2591 | 261 | 2630 | 26 | 26 | 2689 | 270 | 272 | 2748 | 2768 |  |
|  | 618 |  |  |  | 29 |  | 102 | 88 | 60 |  | 4.7915 | 793 | 795 | 79 | 8003 | 8025 | 8047 | 80 | 309 | 8114 |  |
| 10 | 4650 | 4635 | 4619 | 4604 | 88 | 573 | 557 | 42 | 4526 | ． 4511 | 5.3238 | 3263 | 3288 | 3312 | 3337 | 3361 | 3386 | 341 | 3435 | 3460 | 10 |
| 11 | 31 | 3098 | 3081 | 3064 | 3047 | 3030 | 3013 | 2996 | 2979 | 9.296 | 5.8562 | 858 | 8616 | 8643 | 8671 | 8698 | 87 | 8752 | 8779 |  |  |
| 12 | 1580 |  | 1543 |  |  |  |  |  |  | 10.14 |  | 3916 | 3945 |  | 4004 | 4034 | 4063 | 4093 | 4122 | 4152 | 12 |
| 13 | 004 | 0025 | ＋005 | 9985 |  |  |  |  |  |  |  | 9242 | 92 |  | 析 | 37 | 9402 | 9434 | 94 | 9498 | 13 |
| 14 | 8510 | 889 | 8467 | 84 |  |  |  |  |  | 12 | 7.453 |  | 46 | 46 | 4672 | 470 | 4740 | 4775 | 48 |  | 14 |
| 15 | 69 |  |  |  |  |  |  |  |  |  |  |  |  |  | 025 | 0042 | 0079 |  | 0153 |  | 5 |
| 16 | 5440 | 5416 | 5391 | 5366 | 5341 | 5316 | 5292 | 5267 | 5242 | 13.5217 | 8.518 | 522 | 5260 | 5300 | 5339 | 5378 | 5418 | 5457 | 5496 | 553 | 16 |
| 17 | 390 | 387 | 38 | 38 | 380 | 377 |  | 3721 |  |  |  | 054 | 05 |  |  | 07 | 1 | 079 | 0840 |  | 17 |
| 18 | 237 | 23 | 23 | 22 |  |  |  | 2 | 21 | 15.2119 | 9.5829 |  |  |  |  | 605 | 6095 | 6139 | 6183 | 22 | 18 |
| 19 | 0836 | 080 | 077 | 0747 | 0718 | 0688 | 0659 | 29 | 0600 | 16.0570 | 10.11 | 120 | 12 | 12 | 13 | 138 | 1433 | 148 | 152 | 157 | 19 |
| 20 | 9301 | 27 | 23 | 20 | 917 | 9146 | 9115 | 9083 | 9052 | 16．902 | 10.6477 | 65 | 65 | 66 | 667 | 672 | 677 | 682 | 687 | 6920 | 20 |
| 21 | 7766 | 7733 | 7701 | 76 |  |  |  |  |  |  | 11.180 |  |  |  | 2007 | 2059 | 2111 | 2162 | 2214 |  | 21 |
| 22 | 623 | 6197 | 6163 |  |  | 6061 |  | 5992 | Sti | 18． |  |  | 7233 |  |  |  | 449 |  |  |  | 2 |
| 23 | 4696 | 4660 | 4624 | 4589 | 45 | 451 | 4482 | 4446 | 4410 | 19．43 | 12. | 2505 | 2562 | 2618 | 26 | 27 | 27 | 2844 | 2901 | 295 | 3 |
| 24 | 316 | 312 |  | 30 |  |  |  |  | 63 | $20 \cdot 28$ | 12.7 | 783 |  |  | 8008 | 806 | 812 | 8186 | 3245 | 304 | 24 |
| 25 | 1626 |  |  |  |  | 1432 | 1393 |  | 1315 | $21 \cdot 1$ |  | 3158 | 32 | 3281 | 3342 | 340 | 3465 | 3527 | 3588 | 65 | $\underline{25}$ |
| 26 | 00 | 0051 | ＋010 | 9970 | 9930 | 9889 | 9849 | 9808 | 9768 | 21.9728 | 13 | 8484 | 85 | 8612 | 8676 | 8740 | 88 | 8868 | 8932 | 8996 | 26 |
| 27 | 85 |  |  |  |  |  |  |  | 822 |  |  |  |  | 39 |  |  | 41 | 4 | 4275 | 342 | 27 |
| 28 | 702 |  |  |  |  |  |  | 17 | 6673 |  |  |  |  |  | 9343 | 9412 | 9481 | 955 | 9619 |  | 28 |
| 29 | 5486 | 5441 | 5396 | 535 | 530 | 5261 | 5216 | 5171 | 512 | $24 \cdot 508$ | 15.43 | 4463 | 453 | 4605 | 4677 | 4748 | 4820 | 489 | 4962 | 5033 | 29 |
| 30 | 39 | 3904 | 3858 | 3811 |  | 3718 | 3672 | 3625 | 3579 | $25 \cdot 353$ | 15 | 9789 | 9863 | 9937 | ＋01 | 008 | 15 | 23 | 0306 | 3379 | 30 |
| 31 | 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 08 | 083 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 93 | 9295 | 9244 | 9193 |  |  |  |  |  |  |  |  |  |  | 6012 | 6093 | 617 | 625 | 6336 | 641 | 33 |
| 34 | 781 |  |  |  |  |  |  | 7442 |  |  | 18.10 | 10 |  | 1262 |  |  |  |  |  |  | 34 |
| 35 | 6276 | 22 | 6168 | 61 | 6059 | 05 | 5950 | 5896 | 5842 | 29.5787 | 18.63 | 64 | 6507 | 659 | 667 | 6765 | 685 | 693 | 7023 | 710 | 35 |
| 36 | 47 | 4685 | 4630 | 4574 | 4518 | 4462 | 4406 | 4350 | 4294 | 30＇4238 | $19 \cdot 1658$ | 1747 | 1835 | 1924 | 2013 | 2101 | 2190 | 2278 | 2367 |  | 36 |
| 37 | 32 | 3149 |  |  |  |  |  |  | 2747 | 31．2689 |  |  |  |  |  | 74 |  |  |  |  |  |
| 38 | 167 | 16 | 15 |  |  | 1377 |  | 1259 | 119 | 32．11 |  | 239 |  |  | 268 | 277 | 286 | 29 |  | 314 | 38 |
| 39 | 013 | 0076 | －015 |  |  | 9834 |  |  |  |  |  |  |  | 79 | 8014 | 811 | 820 |  |  |  | 39 |
| 40 | 8601 | 8539 | 8477 | 8415 | 8353 | 8291 | 8229 | 8167 | 8105 | 33.8043 | 21.2954 | 3052 | 3151 | 3249 | 3347 | 3446 | 3544 | 3643 | 374 | 8839 | 40 |
| 41 | 70 |  | 6939 |  |  |  | 6685 | 621 |  |  | 21．827 |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 553 | 54 | 54 |  |  |  |  | 507 | 5010 |  | $22 \cdot 36$ |  |  |  |  |  | 42 |  | 4428 |  | 42 |
| 43 | 399 | 3930 |  |  | 37 |  | 3596 | 3529 | 3463 | 36．339 | 22－89 | 9031 | 9 | 92 | 9348 | 94 | 95 |  |  | 987 | 43 |
| 44 | 2461 |  | 23 | 2257 |  | 2120 | 052 | 198 | 191 | 37 | $23 \cdot 42$ | 4357 | 4466 | 457 | 4682 | 47 | 489 | 50 | 5115 | 52 | 44 |
| 45 | 0926 | 88 | 07 | 0717 |  | 0578 |  |  | 036 | $38^{\circ} 029$ | 23.95 | 9684 | 9794 | 990 |  | 012 | 023 | 矿 | 045 |  | 45 |
| 46 | 9391 | 9320 | 9249 | 9178 |  | 9035 | 8963 | 8892 |  | 38.8744 | 24．489 | 5010 | 5123 | 5236 | 5350 |  |  |  |  |  | 46 |
|  | 785 |  |  |  |  |  |  |  |  | $39 \cdot 7200$ | 25.02 |  | 0452 | 0568 |  |  |  |  |  |  |  |
| 48 | 632 | 62 | 617 | 609 | 6024 | 5949 |  |  | 57 | 40 |  |  |  |  |  |  |  |  |  |  |  |
| 49 | 4786 | 47 | 46 |  | 83 | 4407 | 31 | 4254 | 4178 | 41 | 26.08 | 09 | 11 | 12 | 135 | 14 | 15 | 1712 | 1833 | 195 |  |
| 50 | 32 | 3174 | 309 | 3019 | 2942 | 2864 | 86 | 2709 |  | 42.2553 | 26.619 | 63 | 6438 |  | 6684 | 6807 |  | 7053 | 776 | 729 | 50 |
| 51 | 17 | 163 |  | 1479 | 1400 | ， | 1242 |  |  |  | $27 \cdot 15$ | 164 | 17 |  | 2018 |  |  |  |  |  | 51 |
| 52 | 01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 86 | 85 |  |  | 8318 | 8236 | 8153 | 807 |  | 4 | 28 |  | 2424 | 矿 |  | 28 |  |  |  |  | 53 |
| 54 | 7112 | 70 |  |  |  |  |  |  |  | 45 |  |  |  |  |  |  |  |  |  |  |  |
| 55 | 5577 | 54 |  |  |  |  |  |  | 48 | $46 \cdot 48$ | $29 \cdot$ | 2947 | 3082 | 3217 |  |  | 3623 | 3759 | 3894 | 402 | 55 |
| 56 | 4042 | 3955 | 3868 |  |  |  |  |  |  |  | 29.81 |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 25 | 2418 | 2330 | 2242 | 53 | 2065 | 1976 |  | 179 | 48．1711 |  |  |  | 3880 |  |  |  |  | 458 | 472 |  |
| 58 | 0972 |  |  |  |  |  |  |  | 025 | $49^{\circ} 0$ |  |  |  |  |  |  |  |  |  |  |  |
| 59 | 943 |  |  |  |  |  |  |  |  | ． 86 |  | 4252 | 4397 | 454 |  |  | 4978 | 123 | 5268 | 541 |  |
| 60 | 7902 |  | 7716 | 7623 | 30 | 7437 | 7344 | 250 | 715 | 50，706 | 1.9430 | 9578 | 9726 | 987 | 02 | 016 | 031 | 046 | 0611 | 07 |  |
| 61 | 636 | 627 | 6178 | 6083 |  | 5894 |  |  |  |  |  | 49 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 329 | 31 | 31 |  | 2906 |  |  |  |  | 53．2417 | 33 |  |  |  |  |  | 633 | 1818 | 66 | 6797 |  |
| 64 | 17 | 16 |  |  |  | 1266 |  |  |  |  |  | 0883 |  |  |  |  |  | 1828 |  |  |  |
| 65 | 02 |  |  |  |  |  |  |  |  | 54.93 | 34 |  |  |  |  |  |  |  |  |  | 65 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
|  | 71 | 70 | 69 | 6846 | 67 | 6638 |  | 64 | 632 |  | 35.66 |  |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  | 2523 | 269 |  |  |  |  |  |  |
| 69 | 408 | 398 | 3873 | 376 | 析 | 3552 | 3445 | 333 | 3231 | 58．31 | 3673 | 75 | 76 | 785 | 802 | 81 | 83 | 85 | 87 | 827 |  |
| 70 | 255 | 2444 | 233 | 2227 | 2118 | 2010 | 1901 | 179 | 1683 | 59．1574 | $37 \cdot 26$ | 284 | 3013 | 318 | 335 | 353 | 370 | 387 | 4047 | 421 | 70 |
|  |  | 937 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 948 | 937 |  |  |  |  |  |  |  |  |  |  |  | 9848 |  |  | 4380 |  |  |  |  |
| 73 | 79 | 783 | 77 | 7608 | 7495 | 7381 | 7268 | 7155 | 70 | 619628 | 38．86 | 882 | 900 | 9179 | 935 |  | 97 | 989 | －077 | 025 | 73 |
| 7 | 6412 | 628 | 6183 |  |  |  | 5724 |  |  | 62.5379 | 39.3964 |  | 析 | 4511 | 469 |  |  |  | 42 |  |  |
| 75 | 4877 | 476 | 4645 | 4529 | 4412 | 4296 | 417 | 406 | 3946 | 63．383 | 39.928 | 9473 | 965 | 9842 | －02 | 021 | 039 | 0580 | 076 | 09 | 75 |
| 76 | 334 | 3225 | 310 | 2989 | 2871 | 2753 | 2635 | 2517 | 239 | 64．2281 | 40.46 | 479 | 498 | 5173 | 536 | 55 | 57 | 59 | 610 | 202 | 76 |
| 77 | 1807 | 1688 | ， | 4， | 析 | 1210 | 1091 | 997 | 8852 | 65.073 | 40.99 | －125 | 031 | 0504 | 0694 | 888 | 1073 |  |  |  |  |
| 78 | 027 | 01 | － |  | 9789 | 68 | ， | 9425 | 9304 |  | 41.5 |  | S63 | 5 | 6027 | ， |  | 6603 | 析 |  |  |
| \％ | 873 | 8615 | 8493 | 8370 | 8248 | 8125 | 8002 | 7880 | 7757 | 66.763 | 42.0583 | 0778 | 097 | 116 | 136 | 155 | 175 | 19 | 213 | 233 |  |
| 80 | 7202 |  |  |  |  |  | S |  |  | $67 \cdot 6085$ | 42 | 610 | 6301 | 6498 | 6695 | 6892 | 7088 | 7285 |  | 767 | 80 |
| 81 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 4132 | 400 | 3878 | 3751 | 3624 | 3497 | 3370 | 3242 | 3115 | 69•2987 | $43^{\prime} 65$ | 675 | 695 | 7160 | 736 | 75 | 776 | 砣 |  | 8371 |  |
| 83 | 2597 | 2469 | 20 | 2212 | 2083 | 1954 | 1825 | 1696 | 1567 | 70.1438 | 44：18 | 2083 | 228 | 248 | 269 | 29 | 310 | 33 | 3512 | 37 |  |
| 84 | 1063 | 0932 | 20， | 0672 | 0542 | 411 | 0281 | 0150 | －020 |  | 4 | 7409 | 7616 |  |  | d | 8481 | 8689 |  | 906 |  |
| 85 | 95 | 9396 | 9264 | 9132 | 9001 | 8869 | 873 |  | 8473 | 71.834 | 45.252 | 2736 | 294 | 315 | 336 | 35 | 378 | 3991 | 419 | 440 | 85 |
|  | 798 | 78 | 77 | 7593 | 7459 | 7326 | 19 | 7059 | 2925 | 72．6792 | 45.78 | 8062 | 827 |  |  | 89 | 9120 |  | 9543 | 975 |  |
| 87 | 6458 | 6323 | 6188 | 涯 |  | 83 | 5648 | 551 | 5378 | 524 |  |  | ¢ 6 | 881 | 403 | 424 |  | ， | 4887 | 510 |  |
| 88 | 4923 | 478 | 4650 | 4514 | 4377 | 4240 | 4104 | 3967 | 3830 | 74：369 | $46 \cdot 849$ | 8714 | 8931 | 914 | 9364 | 958 | 979 | －014 | 0230 | 048 | 88 |
| 89 | 3388 | 3250 | 152 | 74 | 析 | 898 | 析 | 2421 | 2283 | 214 | 82 | 4041 | 4260 | 447 | 469 | 491 | 513 | 535 | 557 | 5rs |  |
| 90 | 1853 | 1713 | 1574 | 3 | 1295 | 115 | 1015 | 087 | 0736 | ． 059 | 47.914 | 9367 | 958 | 810 | ＋032 | 25 | 047 | 析 | 091 | 113 | 90 |
|  | 0318 | 0177 | 36 | 95 | 754 | 612 | 9471 | 9330 | 寿 |  |  |  | 4 | 硣 | 硣 |  | 581 | 楮 | 626 |  |  |
| 92 | 878 | 8640 | 8498 | 8355 | 8212 | 8070 | 792 | 778 | 7641 | 77749 | 48.9793 | ＋02 | 0246 | 047 | 069 | 09 | 115 | 137 | 160 | 183 | 92 |
| 93 | 7248 | 510 | 6960 | 6815 | 513 | 6527 | 6383 | 623 | 6093 | 78.594 | $49 \cdot 5117$ | 5346 | 5575 | 580 | 603 | 626 | 649 | 6719 | S92 |  | 93 |
|  | 571 | 55 | 5422 | 52 | 51 | 4984 | 4838 | 469 | 4546 | 79.4400 | 50．0441 | 0672 | 0904 | 113 | 136 | 15 | 182 | 206 |  | 252 |  |
| 95 | 417 | 4031 |  |  |  | 3441 | 32 | 3146 | 2999 | 2851 | 50.5765 | 599 | 623 | 6466 | 670 | 6934 | 7167 | 7401 | 7635 |  | 95 |
|  | 2643 |  |  |  |  | 1899 | \％ | 601 |  |  |  |  |  |  |  |  |  | 析 |  |  |  |
|  | 115 | 095 |  | 065 | 05 | 0356 | 0205 | －05 | 9904 | 81.9753 | $51 \cdot 6412$ | 6651 | 6890 | 299 | 7367 | 760 | 7845 | 883 | 832 | 856 |  |
|  | 9573 | 9421 | 9269 | 17 | 965 | 813 | 661 | 8509 | 8357 | 82.8204 | 52．173 | 1977 | 2219 | 2460 | 270 | 294 | 3183 | 3424 | 3665 | 390 | 98 |
|  |  |  |  |  |  | 5728 | S573 | 596 | 685 | a | 52.7060 | 7304 |  |  | 833 | 827 | 852 | 8765 | 9609 |  | 0 |
| 100 | 㖪 | 6348 | 6193 | 6038 | 5883 | 5728 | 5573 | 5417 | 5262 | 84.5106 | 532384 | 2630 | 2876 | 3122 | 3369 | 3615 | 3861 | 4107 | 4352 | 4598 | 100 |
|  | $0^{\prime}$ | $49^{\prime}$ | 48 | 47 | $46^{\prime}$ | $45^{\prime}$ | $44^{\prime}$ | 43 | 42 | 11 |  |  |  |  | 46 | $45^{\prime}$ | 44 | $43^{\prime}$ | 42＇ | $41^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | SINE． |  |  |  |  |  |

TRAVERSE TABLES．

| $32^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $32^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 20 | 21 | $22^{\prime}$ | $23^{\prime}$ | $24^{4}$ | 25 | $26^{6}$ | 27 | 28 | 29 | 20 | 21 | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ |  |  |  |  |  |
|  | 8450 | 84 | 84 | 8445 | 84 | 8442 | 8440 | 843 | 843 | ． 8439 | ${ }^{5} 5348$ | 5351 | 5353 | 5356 | 5358 | 53 | 5363 | 5366 | 5368 | 5371 |  |
|  |  | 68 | 6893 |  |  |  | 6880 | 6877 |  |  | 1.0697 | 070 |  | 0712 | 07 |  |  |  |  |  |  |
|  |  |  | 53 | 5335 | 5330 | 5325 | 20 | 5316 |  |  |  | 6053 |  |  | 6075 | 608 | 6095 | 6097 | 6104 | 6112 |  |
|  | 379 |  | 3786 | 3779 | 3773 | 3767 | 361 | 3754 | 374 |  | 2.1 | 140 | 1473 | 1423 | 1433 | 146 | 1453 | 1463 | 1472 | 1482 |  |
|  | 2248 |  | 2232 | 22 | 2216 | 2209 | 2201 | 2193 | 2185 | 4.2 | $2 \cdot 6$ | 6754 | 6767 |  |  | 6804 | 6816 |  |  | 6853 |  |
|  | 0697 | 0688 | 0678 | 0669 | 0660 | 0650 | 0641 | 632 | 062 | 5.0613 | 3．2091 | 2105 | 2120 | 2135 | 2150 | 2164 | 2179 | 2194 | 2209 | 2223 | 6 |
|  |  |  | 9125 | 14 | 9103 | 909 | 9081 |  |  |  |  | 7456 |  |  | 508 | 525 | 7542 | 755 |  |  |  |
|  | 7596 | 7584 | 7571 | 7559 | 7546 | 7534 | 7521 | 75 | 7496 | 6.748 | 42788 | 2807 | 2827 | 28 | 2866 | 2886 | 2905 | 2925 | 2945 |  |  |
|  |  | 60 |  | 6004 | 5990 | 597 | 5961 | 5947 | 5933 | $7 \cdot 59$ | 4.8136 | 8158 | 8180 | 8202 | 8224 | 8247 | 8269 | 8291 |  |  |  |
| 10 | 449 | 4480 | 4464 | 48 | 4433 | 4417 | 4402 | 4386 | 4370 | 8. | 3684 | 3509 | 3534 | 355 | 3583 | 3607 | 3632 | 3656 | 3681 |  |  |
| 11 | 294 | 29 |  | 2893 | 2876 | 285 | 2842 | 2825 | 2807 | 9.2 | ．8833 | 8860 | 888 | 891 | 894 | 896 | 899 | 9022 | 9049 |  | 1 |
| 12 |  | 13 | 1357 | 1338 | 13 | 1301 | 1282 | 1263 | 1244 | $10 \cdot 12$ | 81 | 4211 | 4240 | 42 |  | 43 | 4358 | 4388 | 4417 |  | 2 |
| 13 | 984 | 98 | 98 | 9783 | 97 | 97 |  |  |  |  |  | 9562 | 9594 | 962 | 965 |  |  | 9753 |  |  | 3 |
| 14 |  |  |  |  |  | 81 | 8162 |  | 8119 |  |  | 4913 |  | 49 |  |  |  |  |  |  | 4 |
| 15 | 67 |  |  |  |  |  |  |  | 6556 | 12.65 | 8.0227 | 0263 |  | 033 | 037 | 0411 | 0448 | 5 | 0521 | 10558 | 15 |
| 16 | 519 |  |  | 5117 |  | 5068 |  |  |  |  | 8.5575 | 5614 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 | 209 | 20 | 2035 | 07 | 1979 | 19 | 19 | 1895 | 1867 |  |  | 6316 | 6360 | 6405 | 64 | 6493 | 6537 | 658 | 6626 |  | 18 |
| 19 | 054 | 05 |  | 0452 | 0422 | 0393 | 03 | 0333 | 0304 | 16. | $10^{1 / 1620}$ | 1667 | 1714 | 1760 |  | 1854 | 900 | 1947 | 1994 |  | 19 |
| 20 | 8990 | 8 |  | 析 |  | 8834 | 8803 | 8772 | 8741 | 16.8710 | 10.6967 | 18 | 7067 | 位 |  | 7214 | 764 | 7313 |  |  | 2 |
| 21 | 7440 | 740 | ${ }^{73}$ | ${ }^{7342}$ | 730 | 7276 | 7243 | 7211 | ${ }^{7178}$ | 17.7145 | 112317 | 236 | ${ }^{2420}$ | 24 | 252 | 2575 | 26 |  | 2730 |  | 1 |
|  | 58 | 58 | 58 | 5786 | 5752 | 5718 | 5684 | 5649 | 5615 | 18 | 1176 | 7720 | 777 | 78 |  | 79 |  | 8044 |  |  | 2 |
| 23 | 433 | 43 | 42 | 4231 | 4195 | 4160 | 4124 | 40 | 4052 | 19 | 12. | 3071 | 312 | 318 | 32 | 32 |  |  | 3466 |  | 23 |
|  |  |  |  |  |  |  |  |  | 2489 |  |  | 8422 | 84 | 85 |  |  |  |  |  |  | 4 |
| 25 | 12 | 1199 | 1160 | 1121 | 1082 | 1043 |  | 0965 |  | 21.08 | 13 | 7272 | 383 | 389 | 395 | 4018 | 4079 | 4141 |  |  |  |
|  | 968 |  |  |  |  |  |  |  |  | 21 | 180 |  |  |  |  |  |  |  |  |  |  |
|  | 813 |  |  |  |  |  |  |  |  |  | 14：4 | 447 | 454 | 46 |  |  |  | 487 |  |  | ${ }^{27}$ |
| 28 | 65 |  | 64 | 6455 |  |  |  |  |  |  |  |  |  |  |  |  | 01 | 0238 | 0306 | 037 | ${ }^{28}$ |
| 29 | 50 |  |  |  |  |  |  | 4719 |  |  |  |  |  |  |  |  |  |  |  |  | 29 |
| 30 | 3485 | 34 | 3392 | 3345 |  | 3252 |  | 3158 |  | 25 | $16^{\circ} 0453$ | 0527 | 0601 | 0674 |  | 0822 | 0895 |  |  |  | 30 |
| 31 | 1935 | 18 | 1838 | 1790 | 1742 |  | 1645 | 1597 | 1548 | $26^{15}$ | $16 \cdot 5$ | 587 | 5954 | 603 | 61 | 61 | 62 | 633 |  |  | 1 |
|  | 03 | 03 | 0285 |  |  | 013 | 0085 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 33 | 88 | 87 | 8731 |  |  | 85 | 85 | 8474 | 8422 | 27． 83 |  | 6580 | 6661 |  | 6823 |  |  |  |  |  | 33 |
| 34 |  |  |  |  |  | 70 | 69 | 6912 | 6859 |  |  | 193 | 201 |  |  |  |  |  |  |  | 34 |
| 35 | 57 | 5678 | 5624 | 5569 | 5515 | 5460 | 540 | 535 | 5296 | $29 \cdot 52$ | 18.71 | 728 | 736 | 745 | 75 | 7625 | 77 | 77 | 7883 |  | 35 |
| 36 | 4182 | 4126 |  | 4014 | 3958 | 33 | 3846 | 37 | ${ }^{37}$ | $30^{\circ}$ | 19.2 | 26 | ${ }^{2727}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 80 |  |  |  |  |  |  |  | 7 |
|  |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 38 |
|  | 953 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 916 |  |  |  | 39 40 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{array}{ll} 41 \\ 42 \\ 4 \end{array}$ | $\left.\right\|_{687} ^{645}$ | $10_{10}^{630}$ |  |  |  |  |  | 5983 | 5919 |  |  |  |  |  |  |  |  | 9991 5357 |  |  | 42 |
| 43 | 332 | 32 |  | 3128 |  |  |  |  |  |  |  |  |  |  |  |  | 061 | 072 |  |  | 63 |
|  | 177 |  |  | 1573 | 1504 | 1436 | 1367 | 1293 |  | 37.116 | 23.533 |  | 55 |  |  |  |  |  |  |  | 4 |
| 45 | 228 | 015 | 0088 | P018 | 9948 | 9877 | 9807 | 9737 | 9667 | 37．95 | 24.068 | 079 | 090 | 10 | 11 | 123 | 134 | 145 | 1564 |  | 5 |
|  | 86 | 86 | 85 |  |  | ${ }^{83}$ | 82 | 81 | 810 | 38. | 24. |  |  |  |  |  |  |  | 16932 |  |  |
|  | 1 |  |  |  |  |  | 66 |  |  |  |  |  |  |  |  |  |  |  |  |  | 47 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8 |
| 49 50 | 40 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 93 |  |  |  | 90 | 8969 | ${ }_{88}$ | 880 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 782 | 77 |  |  | 74 | 74 | 73 | 72 | 716 | 44.7 | $28 \cdot 3$ | 355 | 372 | 38 | 398 | 411 | 424 | 437 | 45 |  | 53 |
| 54 | 62 |  |  |  |  | 58 |  |  |  | $45 \cdot 5$ |  |  |  |  |  |  |  |  |  |  | 54 |
| 55 | 472 | 463 | 45 | 4466 | 43 | 42 |  | 412 | 403 | 46.39 | 29.41 | 42 | 443 | 45 | 470 | 480 | 497 | 5110 | 5245 |  | 5 |
|  | 317 | ｜ 3085 | 29 | 2911 | 2824 | 27 | 2645 | 256 | 247 | $4^{4723}$ | 29.95 | 965 | 978 |  | P06 |  | 033 | 047 | 0613 |  | 56 |
| 57 | 16 | 1533 |  |  |  | 1178 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 57 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 58 |
| 59 60 | 85 | 84 |  |  |  |  |  | 7316 |  | 49.7693 50.6129 |  |  |  |  |  |  | 1791 |  |  |  | 50 |
|  |  |  |  |  |  |  |  |  |  |  | ${ }^{32} 6$ |  |  |  |  |  | 715 | 7304 |  |  |  |
|  |  |  |  |  | 3483 | 3387 |  | 31 |  |  |  |  |  |  | 22 |  | 251 |  |  |  |  |
| 63 | 23 | 22 | 21 |  |  | 18 | 173 | 16 | 153 |  |  |  |  |  |  |  |  |  |  |  | 63 |
| 64 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 324 |  | 3558 |  | 5 |
| 65 | 921 | 911 | 9016 |  |  | 87 |  |  | 8408 | 54 | 34 | 7808 | 79 | 8128 |  |  |  | 8766 |  |  | 65 |
|  | 7668 | 756 | 74 | 7359 | 7256 | 7154 | 7051 | S38 | 683 | 55．671 |  | ） | 332 |  |  | 919 |  | 413 | 429 |  | 66 |
|  | 61 |  |  |  |  |  |  | 5386 | 5282 |  | 35 |  |  | 883 |  | 9 | 砣 |  |  |  | 67 |
| 6 | 45 |  | 43 |  |  | 403 | 3931 |  |  | 57 |  |  |  |  |  |  |  |  |  |  | 58 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 69 |
| 70 | 1466 | 1357 |  |  |  |  | 081 | 070 | 059 |  |  | 45 |  |  |  |  |  |  |  |  | 70 |
|  |  |  |  |  |  | 7 |  | 75 | 903 |  | 3， | 991 |  |  |  |  |  |  |  |  | 1 |
|  |  |  |  |  |  |  |  | 757 |  | 60 | 38.5 |  |  |  |  | 5972 | 6149 | 632 |  |  | 72 |
| 73 | 68 | 6700 |  |  |  |  |  |  |  |  |  |  |  |  |  | 133 |  |  |  |  | 73 |
|  | 52 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 74 75 7 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 21 |  |  |  | 01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 77 |
| 78 |  |  |  |  |  |  | 8333 | 82 |  | d | 4 | 737 | 矿 | 寿 | 名 | 813 | 32 |  |  |  | 78 |
| 79 | 75 |  |  |  |  |  |  | 64 | 52 | $66^{6} 6403$ | 42.2527 | 2721 | 291 | 3109 | 33 |  | 3691 | 3885 |  |  | 79 |
| 80 | 59 | 5836 | 5712 | 5587 | 5462 | 5338 | 5213 | 5088 | 49 | 67－4838 | 42.7875 | 8072 | 8268 | 8465 | 8661 | 8858 | 9054 | 2 |  |  | 80 |
|  | 4410 | ${ }^{4284}$ |  |  | 3906 | 3779 | ${ }^{36}$ | 3527 | 3400 | ${ }^{68 \cdot 3274}$ | 43 | ${ }^{3623}$ | ${ }^{3622}$ | 382 | 4020 | 4219 | 4417 | ${ }^{4616}$ |  |  | 1 |
|  | 2860 | 27 | 26 |  | 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 咗 |
| 84 | 97 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 84 |
| 85 | 8208 | 8076 | 7944 |  |  |  | 7614 | 728 | 714 | $11 \cdot 7$ | $45^{\prime} 46$ | 482 |  |  |  |  | 587 |  |  |  | 85 |
| 86 |  |  |  | 6256 |  | 5988 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 510 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 88 | 35 | 342 | 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 88 |
| 89 90 |  | 1868 0316 | 0176 | ．035 | 9895 | 9755 | 961 | 1035 | 9334 | 75．0757 | $48 \cdot 1360$ | 1581 | 1882 | ${ }_{2023}$ | 2244 | 246 | ${ }_{2686}^{7323}$ | ${ }_{2907}^{754}$ |  |  |  |
|  | 89 |  |  |  |  |  |  |  |  |  | 48.6708 | ${ }^{6932}$ |  |  |  |  | 8049 | ${ }^{8273}$ | ${ }^{8496}$ |  | 91 |
|  | 7355 |  |  |  |  |  |  | 635 |  |  |  |  |  |  |  |  |  |  |  |  | 92 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 50.2753 50.8102 |  | ${ }_{85} 32$ |  | ${ }_{9035}^{3677}$ | 926 | 950 | 973 |  |  | 94 |
|  |  |  |  |  |  |  | 0255 | －106 |  |  | 51 |  |  | 41 | 4394 | 4630 | 4865 | 510 |  |  |  |
|  | 9602 | 9451 |  |  |  | 8847 | 8696 | 8544 |  | 81 | 51.879 | 9037 | 927 |  | 9752 |  |  | 0466 | 0705 |  |  |
|  | 8052 |  |  |  |  |  |  |  |  |  | ${ }^{52} \cdot 1447$ | 438 | 46 | 488 | 51 | 5351 |  |  | 607 |  |  |
|  | 551 |  |  |  |  |  |  |  | 370 |  | 52 | 5090 | 5336 | 581 | 5827 | 672 | 6318 | 5563 | 6809 | 054 | 100 |
|  |  |  |  | $\frac{4484}{37}$ | $\frac{4328}{36^{\prime}}$ | 472 | $14^{\prime}$ | $33^{\prime}$ | $32^{\prime}$ | 131＇ |  | 1 $39^{\prime}$ |  | $37^{\prime}$ | 36 | 35 | $134^{\prime}$｜ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 32 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $32^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | 34＇ | $35^{\prime}$ | 36 | $37^{1}$ | $38^{\prime}$ | $39^{\prime}$ | $30^{\prime}$ | 31 | 32 | $33^{\prime}$ | 34＇ | $35^{\prime}$ | $36^{\prime}$ | $37^{\prime}$ |  |  |  |
|  | 8434 | 843 | 843 | 8429 | 842 | 84 | 84 | 84 | 84 | ＇8420 | ． 5373 | 5375 | 5378 | 5380 | 5383 | 5385 | 5388 | 5390 | 5393 | 5395 |  |
|  |  |  | 6 |  |  |  |  | 6846 |  |  | 0746 | 0751 | 0756 | 076 |  | 07 | 0775 | 780 | 0785 |  |  |
|  | 5302 | 5297 | 529 | 5288 | 5283 | 5278 | 527 | 5269 | 5264 | 2.52 | \％ | 6126 | 6134 | 614 | 614 | 6156 | 6163 | 6170 | 6178 |  |  |
|  | 37 | 3729 | 372 | 37 |  |  |  |  | 3686 | ． 367 |  | 150 | 151 | 152 | 1531 | 15 | 1551 | 1561 | 1570 | 1580 |  |
| 5 | 2170 |  |  |  |  |  |  |  |  |  |  | 6877 | 6890 | 6902 | 6914 | 6926 | 593 | 695 | 69 | 6975 |  |
| 6 | 06 | 0594 | 0585 | 0575 | 0566 | 0557 | 0547 | 0538 | 0528 | ． 051 | ．2238 | 2253 | 2267 | 2282 | 225 | 2312 | 2326 | 2341 | 2356 | 2370 |  |
|  | 9037 | 902 | 901 | 9005 | 8994 |  | 89 |  | 8950 |  |  | 7628 | 7645 | 7662 |  | 7697 | 7714 | 7731 | 7748 |  |  |
|  |  |  |  |  |  |  | 7396 |  |  |  |  | 3004 | 3023 |  | 306 | 308 | 3102 | 3121 | 3141 | 3160 |  |
|  | 590 | 589 |  |  |  | 5835 | 582 | 5807 | 579 | $7 \cdot 577$ | ， | 8379 | 8401 | 842 | 844 | 846 | 84 | 8511 | 3533 |  |  |
| 10 | 4339 | 432 | 4308 | 4292 | 4277 | 4 | 4245 | 4230 | 4214 | 84198 | 込 | 3754 | 3779 | 3804 | 382 | 385 | 3877 | 3902 | 3926 | 3951 | 0 |
| 11 | 2773 | 275 | 27 | 27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  | 10. |  | 4505 |  | 4564 |  |  | 4652 | 4682 |  |  | 12 |
| 1 | 964 | 962 | 96 | 9580 | 95 | 9539 | 951 |  | 9478 | 10.9 |  | 988 | 991 | 9945 | 99 | \＄0 | 0040 | 0072 | 10 |  | 13 |
| 1 | 807 |  |  |  |  |  | 79 | 7921 | 1 | 11787 | 5222 | 5256 | 529 | 5325 | 535 | 5394 |  | 5462 | 5497 | 5531 | 14 |
| 15 | 65 | 6485 | 6462 | 6438 | 6415 | 6391 | 6368 | 6344 | 21 | 12 | ． 0595 | 0632 | 066 | 070 | 07 | 0779 | 16 | 852 | 0889 |  | 15 |
| 16 | 49 | 4918 | 4893 | 4868 | 4843 | 4817 | 4792 | 4767 | 4742 | 13 | 8.5968 | 6007 | 6046 | 6086 | 6125 | 61 | 6203 | 6243 | 6282 |  | 16 |
| 17 | 337 |  |  |  | 3270 | 3244 | 321 |  | 3164 | 14 |  |  |  | 146 |  |  | 1591 | 1633 | 1674 |  | 7 |
| 18 | 1810 |  |  |  |  |  |  | 1613 |  |  |  |  |  | 684 |  |  | 6979 | 023 | 706 |  | 18 |
| 19 | 0244 | 0215 | 0185 | 0155 | 0125 | 0096 | 006 | 0036 | ＋006 | 15 | $10 \cdot 20$ | 21 | 2180 | 2227 | 22 | 23 | 2366 | 2413 |  |  | 9 |
| 20 | 8678 | 8647 |  |  | 8553 | 8522 |  |  |  | 16. | 10 |  |  |  |  | 7705 | 7754 |  |  |  | 20 |
| 21 | 71 |  |  |  |  |  |  |  |  | 17 | 11.2833 |  | 293 | 2987 |  | 3090 |  |  |  |  | 21 |
| 22 | 55 | 551 | 547 |  |  |  |  |  |  |  | 11 | 82 | 8314 | 83 |  | 8476 |  |  | 863 |  | 22 |
| 23 | 3980 | 394 |  |  | 3836 |  |  |  |  | 19 | $12 \cdot 3579$ |  |  |  |  |  |  |  | 403 |  | 23 |
| 24 | 241 |  |  |  |  |  |  |  |  |  | 12.89 | 90 | 907 | 912 |  | 246 | 3305 | 9364 | 942 |  | 24 |
| 25 | 084 | 0809 | 0770 |  |  | 0652 | 0613 | 0574 | 0535 | 21. | 13.43 | 438 | 444 | 450 | 45 | 4631 | 469 | 475 | 481 | 487 | 25 |
| 26 | 928 | 9241 | 9200 | 9160 | 9119 | 9078 | 9038 | 8997 | 8956 | 21．8915 | 13.9698 | 9762 | 982 | 988 | 9953 | 1017 | 0080 | 10144 | 0208 |  | 26 |
| 2 | 77 |  |  |  |  |  |  |  |  |  |  | 5137 | 5203 |  |  |  |  | 534 |  |  | 27 |
| 28 | 615 | 61 |  | 6018 | 59 | 593 | 58 | 5843 | 5799 | $23 \cdot 57$ | 15.0444 | 0513 | 058 | 06 | 0719 | 0787 | 0856 | 0924 | 099 |  | 28 |
| 29 | 458 | 45 |  | 4447 | 4402 | 435 |  |  | 4220 | 24.41 |  |  |  |  |  |  |  |  |  |  | 29 |
| 30 | 3017 | 297 |  | 2877 | 2830 | 2783 | 2736 |  |  | $25^{2595}$ | 16.1190 | 1263 | 1337 |  |  | 558 | 1631 | 705 | 177 |  | 30 |
| 31 | 14 |  |  |  |  |  |  |  |  |  | 16 |  |  |  |  |  |  |  |  |  |  |
| 32 | 988 | 983 | 978 |  | 9685 | 963 |  |  | 948 |  |  | 20 |  |  |  |  | 240 | 2485 | 256 |  | 32 |
| 33 | 83 |  | 8216 |  |  | 806 |  |  |  | 27 | 17.7309 |  |  |  |  |  |  |  |  | 03 | 33 |
| 34 | 6753 | 670 |  |  | 6540 |  |  |  |  |  |  | 276 |  |  |  |  | 3182 | 326 | 33 | 343 | 34 |
| 35 | 5187 | 513 | 507 | 5023 | 4968 | 4913 | 4858 | 4803 | 4749 | 29.4694 | 18 | 8141 | 82 | 8312 | 8398 | 8484 | 8570 | 865 | 87 | 882 | 35 |
| 36 | 362 | 3565 | 3508 | 3452 | 3396 | 3339 | 3283 | 3226 | 3170 | $30 \cdot 3113$ | 19.3428 | 3516 | 3604 | 3693 | 3781 | 3869 | ｜ 3957 | 4046 | 4134 | 422 | 36 |
| 37 | 205 |  |  |  | 1823 | 176 |  |  | 1591 | 31.153 | 19.8801 |  |  |  |  | 9255 | 34． |  | 526 |  |  |
| 38 | 048 |  |  | 0310 | 0251 | 019 | 013 | 0072 | －01 | 31.9 | 20 | 426 | 436 | 44 |  | 46 | 473 | 48 | 49 | 501 | 38 |
| 39 | 89 |  |  |  | － |  |  |  | 43 | $32 \cdot 83$ |  |  |  | 98 |  | 10 | 012 | 021 | 0312 |  | 39 |
| 40 | 7357 | 7294 | 7231 | 7169 | 7106 |  |  | 6918 | 6856 | 33.679 | 21 |  | 5116 | 5214 | 5312 | 410 | 5508 |  | 5704 | 580 | 40 |
| 41 | 579 | 5726 | 5662 |  | 553 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 422 | 41 | 409 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 265 |  |  |  |  |  |  | 2187 | 2120 | 36 | 23 | 1144 | 1250 |  | 1461 | 1566 | 1671 | 1777 | 882 | 987 | 43 |
| 44 | 1092 | ， |  |  | 0817 |  | 0679 | 10 | 0541 | $37^{\circ} 0$ |  | 65 | 66 | 673 | 68 | 695 | 251 |  |  | 矿 | 44 |
| 45 | 952 | 9456 | 9385 |  |  |  |  | 33 |  | 37－88 | $24 \cdot 17$ | 189 | 200 | 21 | 220 | 233 | 2447 |  |  | 277 | 45 |
| 46 | 79 | 7888 | 7816 | 7744 |  |  |  | 7456 | 7384 | 38.731 | 24.7158 | 7271 | 7383 |  |  | 7722 |  |  |  |  | 46 |
|  | 63 |  |  |  |  |  |  |  |  | 39．573 | 25.2531 |  |  |  |  |  |  |  |  |  |  |
| 4 | 482 | 47 | 4678 | 46 |  | 44 | 43 | 4302 | 42 | 40.4 |  |  |  |  |  |  | 861 | 87 |  |  | 48 |
| 49 | 32 |  |  |  |  | 28 |  |  | 2648 | $41 \cdot 25$ | 26 |  | 351 | 36 |  | 387 | 399 | 41 | 4238 |  | 49 |
| 50 | 1696 | 1618 | 1539 | 1461 | 1383 | 1305 | 1226 | 1148 | 1069 | 42.099 | $26 \cdot 8650$ | 8772 | 8895 | 9018 | 9140 | 263 | 938 |  | 9630 | 975 | 50 |
| 51 | 013 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 85 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 699 |  |  |  |  |  | 6500 | 6417 |  | 62 | 28 |  |  |  | 5289 | 54 | 554 |  |  | 93 |  |
| 54 | 543 | 5347 | 62 | 5178 |  |  | 49 | 48 |  | $45^{\circ}$ |  |  |  |  |  | 0804 | 0936 | 106 |  | 133 | 54 |
| 55 | 3865 | 3779 |  |  | 35 | 3435 | 3349 | 3263 | 317 | 46．309 | $29 \cdot 5$ |  | 57 | 59 | 60 | 6189 | 632 | 66 | 65 | 672 | 55 |
| 56 | 2299 | 2212 |  |  |  |  |  |  |  | $47 \cdot 15$ | 30.088 |  |  |  | 437 |  | 171 |  |  |  | 56 |
|  | 07 |  |  |  |  | 028 |  | 08 | －019 | 47＇993 | 30 |  |  |  |  |  |  |  |  |  |  |
| 58 | 916 | 9076 |  |  |  |  |  |  |  | 48.83 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 47 |  | 6862 | $49^{\circ} 67$ | $31 \cdot 700$ |  |  |  |  | 7730 |  |  |  |  |  |
| 60 | 6035 | 5941 | 5847 | 5753 | 5659 | 5565 | 5471 | 5377 | 5283 | 50.5189 | $32 \cdot 2380$ | 252 | 267 | 2821 | 2968 | 311 | 326 | 340 | 355 | 370 | 60 |
|  | 44 |  |  |  |  |  |  |  |  |  |  |  | 8052 |  |  |  |  |  |  |  |  |
|  | 29 |  |  |  |  |  |  |  |  | 5 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 977 | 9670 |  |  |  |  |  |  | 896 | 53. |  |  |  | 43 |  | 46 |  |  |  |  | 64 |
| 65 |  |  |  |  |  |  |  |  |  | 54．72 | 34.92 |  |  |  |  |  |  |  |  |  | 65 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 56. |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 35 |  |  |  |  |  | 2868 | 2761 | 265 | 57.2 | 36．5 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1414 | 158 |  |  |  |  |  |
| 70 | 037 | 0265 | 155 | －046 | 993 | 982 | 9717 | 9607 | 9497 | 58 | $37 \cdot 611$ | 62 | 645 | 662 | 679 | 6968 | 7140 | 731 | 7483 | 765 | 70 |
| 71 | 8808 |  |  |  | 836 | 8252 | 8141 |  | 791 |  | 38．148 |  |  | 200 | 217 |  | 7915 |  |  |  | 71 |
|  |  |  |  |  |  |  |  |  | 6340 |  |  |  |  |  |  |  |  |  |  |  |  |
| 73 | 567 | 5562 | 5447 | 5333 | 521 | 51 | 4990 | 4876 | 4761 | 61.46 | 39 | 240 | 25 | 27 | 2945 | 312 | 330 | 348 | 366 | 383 |  |
| 74 | 41 |  |  |  |  |  | 3415 | 329 | 318 | $62 \cdot 30$ | 39.76 | 778 | 79 | 81 | 8328 | 850 | 868 | 88 | 90 | 92 | 74 |
| 75 |  |  |  |  |  |  |  |  |  |  | $40 \cdot 29$ |  |  |  |  |  |  |  |  | 462 | 75 |
|  | 09 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
| 77 | 9411 | 9291 | 917 | 90 | 893 |  | 8688 | 8568 | 844 | 64：83 | $41 \cdot 37$ | 39 | 409 | 428 | 4476 | 466 | 485 | 50 | 533 | 5419 | 77 |
| 78 | 784 |  |  |  |  |  |  | 6991 | 6868 |  | 1.90 | 9285 | 4 | 析 | 985 | －05 | －2 | 043 | 062 | 8 | 78 |
| 79 | 62 | 6156 | 32 | 5909 | 578 | 661 | 5537 | 5414 | 5290 | 66.51 | $42 \cdot 446$ | 4660 | 4854 | 5048 | 5242 | 543 | 562 | 582 | 6016 |  |  |
| 80 | 4713 | 4588 | 4463 | 4338 | 421 | 4087 | 3962 | 3836 | 37 | $67 \cdot 358$ | 42.985 | －03 | 023 | 042 | 062 | 082 | 101 | 121 | 140 | 160 | 80 |
| 81 | 31 |  |  |  | 2640 | 2513 | 2386 | 2259 | 213 | 68.20 | 43.52 | 541 | 5610 | 58 |  | 62 | 64 | 6603 | 680 |  | 81 |
| 82 | 1581 |  |  |  |  |  | 析 | 0682 | 5 |  | 44.05 | \％ |  |  |  | 59 | 179 |  |  |  |  |
| 83 | －015 | 9885 | 9755 | 9625 | 949 | 936 | 9235 | 9105 | 897 | 69．88 | 44.59 | 61 | 636 | 656 | 677 | 697 | 718 | 738 | 75 | 7390 | 83 |
| 84 | 8449 | 8317 | 8186 | 8055 |  |  | 析 | 7528 | 7397 | 70 | $45 \cdot 13$ | 1538 | 174 | 195 | 215 | 236 | 256 | 277 | 297 | 318 | 84 |
| 85 | 6883 |  |  |  | 63 | 6218 | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  | 85 |
| 86 | 5317 | 5182 | 5048 | 49 | 47 | 464 | 矿 | 2797 | 423 |  |  | 20 |  | 270 |  |  | 砛 |  |  |  | 86 |
| 87 | 375 | 3615 | 347 | 33 | 320 | 307 | 2934 | 279 | 266 | 73.252 | 46.745 | 766 | 78 | 809 |  | 851 | 873 |  |  |  |  |
| 88 | 284 |  |  |  |  |  |  | 仡 | 082 |  |  |  |  | 4， |  | 3903 | 41 | 析 | 15 |  |  |
| 89 | 0618 | 047 | 0340 | 020 | ＋06 | 9922 | 9783 | 9643 | 9504 | 74．9364 | 47.819 | 8415 | 863 | 8852 | 9070 | 9288 | 950 | 972 | 9942 | ， | 89 |
| 90 | 9052 | 8912 | 8771 | 8630 | 8489 | 8348 | 8207 | 8066 | 7925 | 75.7784 | 48.3570 | 379 | 401 | 4232 | 445 | 4673 | 489 | 511 | 5335 | 555 | 90 |
| 91 | 7486 | 17344 |  |  |  |  |  |  |  |  |  |  |  | 961 |  | －05 |  | 0504 | 0727 |  |  |
| 92 | 5920 |  | 5632 | 5488 | 5344 | 5200 | 5056 | 4912 | 418 | $7 \cdot 323$ | 4．016 | 451 |  | －373 | 52 | 54 | 103 | 285 | 6120 |  |  |
| 93 | 4354 | 4209 | 4063 | 3918 | 3772 | 3626 | 3481 | 3335 | 3189 | 78．3043 | 49.968 | 99 | －12 | 037 | 06 | 082 | 105 | 1285 | 15 |  |  |
| 94 | 2788 | 264 | 2925 | 077 | 2200 | 253 | 析 | 1758 | 1010 | 79．083 |  | 5292 | 5523 | 5753 | 598 | 221 | 6445 | 6675 | 6905 |  | 94 |
| 95 | 1222 | 1073 | 0925 | 077 | 0627 | 0479 | 330 | 0181 | －032 | 79.988 |  |  |  |  | 136 | 1599 | 183 |  |  |  | 95 |
| 96 | 9656 | 9506 | 9356 |  |  | 95 | 754 | 8604 | 8453 | 80 |  | 60 | 62 | 6514 | 6749 | 698 | 722 | 7455 | 7690 |  | 96 |
| 97 | 090 | 矿 | 776 | ， |  | 7331 | 7179 | 7027 | 6875 | $81 \cdot 672$ | 52. | 14 | 1656 | 189 | 13 | 237 | 260 | 2845 | 308 |  | 97 |
| 98 | 652 | 63 | 62 |  |  | 57 | 5603 | 5450 | 5296 | 82.51 | $52.65{ }^{5}$ |  | 7034 | 2755 | 51 | 158 | 7998 | 8235 | 8476 | 8716 | 98 |
|  | 4957 | 4803 | 4648 | 4493 | 4338 | 4183 | 4028 | 3873 | 3717 | 83.35 | $53 \cdot 1927$ | 21 | 2412 | 265 | 289 | 3140 | 3383 | 3626 |  |  |  |
| 100 | 3391 |  | 析 | 2922 | 2766 | 609 | 2452 | 2296 | 139 | 4.198 | 53.7300 | 7545 | 7790 | 8035 | 8281 | 8526 | 8771 | 9016 | 261 | 9506 | 100 |
|  | $30^{\prime}$ | $29^{\prime}$ | 28 | 27 | 26 | 25 | $24^{\prime}$ | $23^{\prime}$ | 22 | 1 |  |  |  |  | ， | 25 | ｜ $24^{\prime}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $32^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $32^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 41 | 42＇ | $43^{\prime}$ | 44＇ | 45 | $46^{\prime}$ | 47＇ | 48 | 49 | $40^{\prime}$ | $41^{\prime}$ | 42 | 43 | 44 | 45 | 46 | 47 | $48^{\prime}$ |  |  |
|  | 8418 | 84 | 84 | 84 |  | 84 |  | 8407 |  | 40 | 539 | 5400 | 5402 | 5405 | 5407 | 5410 | 5412 | 5415 | 5417 | 54 |  |
|  |  |  | 683 | 6827 |  | 682 |  |  |  |  | ． 079 | 080 | 08 | 08 | 01 | O81 | O8 | 08 | 0834 | O839 |  |
|  | 525 | 5250 | 5245 | 524 | 5236 | 5231 | 522 | S2 | 5217 |  | 619 | 62 | 620 | 6215 | 6222 | 62 | 6237 | 6244 | 6251 | 625 |  |
|  | 567 | 36 | 3660 |  |  | 3642 | 3635 |  |  |  | 21590 | 16 | 1610 | 1619 | 1629 | 163 | 164 | 1659 | 1668 | 167 |  |
|  | 209 |  |  |  |  | 2052 |  |  |  |  |  |  | 7012 | 702 | 703 | 7049 |  | 7073 | 7085 | 7098 |  |
|  | 0509 | 0500 | 0491 |  |  | 0462 | 0453 | 0443 | 043 | 5.042 | 3.2385 | 2400 | 2414 | 2429 | 2444 | 2458 |  | 2488 |  |  |  |
|  | 8928 | 89 | 89 |  |  | 8873 | 8862 |  | 88 |  | ， | 7800 |  |  | 7851 | 7868 |  | 7902 |  | 7937 |  |
|  |  | 73 |  |  |  |  |  |  |  | $6 \cdot 72$ | $4 \cdot 3180$ | 3200 | 32 | 32 | 3258 | 327 |  | 3317 | 3337 | 源 |  |
|  | 5764 | 575 | 5736 |  |  | 56 | 5679 | 5665 | 565 |  |  | 8600 | 86 | 86 | 8666 | 868 | 8710 | 87 | 87 | 377 |  |
| 10 | 4182 | 41 | 4151 | 4135 | 4120 | 4104 | 4088 | 4072 | 4057 | 8.4 | $5 \cdot 397$ | 4000 | 4024 | 404 | 4073 | 409 | 412 | 4146 | 4171 | 419 | 10 |
| 11 | 2601 | 2583 | 2566 |  | 253 | 2514 | 2497 | 2480 | 2462 |  | 5.9373 | 94 | 9426 | 945 | 9480 | 95 | 953 | 95 | 9588 | 9615 | 11 |
| 12 | 101 | 100 |  |  |  |  | 06 |  |  |  |  | 4799 | 48 | 48 | 4888 | 491 | 4946 | 497 | 5005 | ， |  |
| 13 | 9437 | 9417 | 93 | 9376 | 9356 | 93 | 9315 | 929 | 927 | 10 | \％ | 01 | 02 | 02 | 0295 | 03 | 0358 | 0390 | 22 | 0454 | 13 |
| 14 |  | 7834 | 781 |  |  |  | 7723 |  |  | 1 |  |  | 56 | 5668 | 5702 | 57 | 571 | 5805 | 5839 | 5873 |  |
| 15 | 627 |  | 6227 |  | 6179 |  | 6132 |  |  |  |  |  | 1036 | 1073 |  | 116 |  |  | 1256 | 1293 | 15 |
| 16 | 46 | 4667 | 4642 | 4617 | 4591 | 4566 | 4541 | 4516 |  | 13.4665 | 8.6360 | 6399 | 6438 | 647 | 6517 | 6556 |  | 6634 | 6673 | 6712 | 16 |
| 17 | 31 | 30 | 30 | 3030 | 30 | 29 | 2950 | 2923 | 289 |  |  | 17 | 18 | 1882 | 1924 |  | 2007 | 2049 |  | 2132 |  |
| 18 | 15 |  | 14 |  | 141 |  |  | 30 | 1302 | 15 | 9.7155 | 71 |  |  | 733 | 73 | 7419 |  |  |  | 18 |
| 19 | 9947 | 9917 | 9887 | 985 | 982 | 979 | 9768 | 38 | 9708 | 15 | 10 | 25 | 26 | 269 | 273 | 27 |  | 2878 |  |  |  |
| 20 | 8365 | 83 | 8302 | 8271 | 8239 | 8208 | 8176 | 8145 | 8113 | 16 | 10.79 | 79 | 80 | 80 | 81 | 819 | 824 | 829 | 83 | 839 | 20 |
| 21 | 6783 | 675 |  |  |  |  |  |  | 6519 | 17•6 | 11.3348 | 339 | 3450 | 3502 | 3553 | 3605 | 36 | 3707 | 3759 | 3810 | 21 |
| 22 | 52 | 516 |  |  |  |  |  | 4959 | 4925 | $18^{\circ} 48$ |  |  |  |  | 8961 | 90 |  | 9122 | 9176 |  | 22 |
| 23 | 36 | 358 | 3547 | 35 | 34 | 34 | 3403 | 336 | 3330 | 19.32 | 12.4143 | 41 | 42 | 43 | 436 | 4424 | 448 | 4537 | 4593 | 464 | 23 |
| 24 |  |  |  | 19 |  |  | 1812 | 1774 | 173 | 20.16 |  |  |  | 97 | 9775 | 983 |  |  | 10 |  | 24 |
| 25 | 045 | 0417 | 0378 | 03 |  | 0260 |  | 0181 |  |  |  |  |  |  | 5182 | 53 |  |  |  |  | 25 |
| 26 | 887 | 88 | 8793 | 8752 | 8711 | 8670 | 8629 | 8588 | 8547 | 21.850 | 14.0335 | 039 | 0462 |  | 290 |  |  |  |  |  | 26 |
| 27 | 72 | 72 | 7208 | 716 |  |  |  |  | 695 |  | 14.57 | 57 |  | 593 | 598 | 606 | 6129 |  |  | 632 | 27 |
| 28 | 571 | 5667 | 5623 | 55 |  |  |  |  | 5359 | $23 \cdot 5$ | 15.1130 |  |  |  | 140 | 14 | 15 |  |  |  | 28 |
| 29 | 412 | 4084 | 4038 | 399 | 39 | 3901 | 3856 | 3810 | 3764 | 24. | 15 | 65 | 667 |  | 681 | 6883 | 69 |  | 709 |  |  |
| 30 | 2547 | 2500 | 2453 | 24 | 2359 | 12 | 2264 | 217 | 2170 | 25.212 | 16 | 19 | 207 | 2146 | 22 | 229 | 236 | 2439 | 251 | 25 | 30 |
| 31 | 09 | 0917 | 0868 | 0820 | 077 |  | 0673 | 0624 | 057 | 26.052 | 16 | 739 | 7474 | 7550 | 7626 | 7702 | 7778 | 785 | 7930 | 800 | 31 |
| 32 | 938 | 9334 | 析 | 9233 |  |  | 9082 | 9032 |  | $26 \cdot 893$ | 17－2720 |  |  |  | 3034 | 311 |  |  |  |  | 32 |
| 33 | 780 | 7750 | 99 | 7647 | 7595 |  | 7491 | 7439 | 7387 | 27.733 | 17 | 81 | 82 | 836 | 84 | 85 | 86 | 86 | 87 | 884 | 33 |
| 34 | 622 | 6167 |  |  |  |  | 5900 |  | 5793 | 28.57 | 18 | 35 |  |  | 38 | 393 | 40 |  | 4181 | 426 | 34 |
| 35 | 463 | 4584 | 4529 | 4474 | 44 |  |  |  |  |  | 18.8913 |  |  |  | 9255 | 93 |  |  | 9598 | 96 | 35 |
| 36 | 305 | 3000 | 2944 | 2887 | 2831 | 2774 | 2717 | 266 | 2604 | $30 \cdot 25$ | 19．431 | 439 |  |  |  |  |  |  |  |  | 36 |
| 37 | 147 | 14 | 1359 | 130 |  |  |  |  | 1010 |  |  | 979 |  |  |  | 016 |  |  |  | －5 | 37 |
| 38 | 989 | 8834 | 977 | 971 | 96 |  |  | 崖 | 615 | 31.935 | 20 | 51 |  |  |  | 55 |  |  |  | 594 | 38 |
| 39 | 831 | 825 | 818 | 812 | 80 | 8005 | 7944 | 382 | 82 | 32 | $21 \cdot 0503$ | 05 | 06 |  |  | 09 | 1075 |  |  | 136 | 39 |
| 40 | 673 | 66 | 66 | 6541 | 64 | 6416 | 6353 | 290 | 622 | 33.61 | $21 \cdot 590$ | 59 | 60 | 61 | 629 | 639 | 648 | 658 | 668 | 678 | 40 |
| 41 | 51 | 5084 | 5019 | 4955 |  |  |  | 4697 | 463 |  | 22 | 139 |  |  |  | 180 | 1900 | 2000 | 2100 |  | 41 |
| 42 | 356 | 3501 | 3435 | 336 |  |  |  | 3104 | 303 | 35.297 |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 198 | 1917 | 1850 | 1782 |  |  | 1579 | 1511 | 14 | $36 \cdot 137$ |  |  | 23 |  |  | 26 | 27 | 28 | 29 | 30 | 43 |
| 44 | 040 | 0334 | 0265 |  |  |  |  | 9919 | 9849 | 36.978 |  |  |  |  |  | 802 |  |  |  |  | 44 |
| 45 | 88 | 87 |  |  |  |  |  |  | 8255 | 37．8184 | 24.28 |  |  | 3218 | 3328 | 3439 |  |  | 376 |  | 45 |
| 46 | 7239 | 7167 |  |  |  |  |  | 6733 | 6661 |  |  |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 56 | 5584 | 5510 | 5436 | 536 |  | 5214 |  | 5066 |  |  |  |  |  |  | 42 | 4373 |  |  |  | 47 |
| 48 | 407 | 4001 | 3925 | 3850 |  |  | 3623 |  | 472 | 40.339 | 25 |  | 93 |  |  | 966 |  |  |  |  | 48 |
| 49 | 249 |  |  |  |  |  |  |  | 1878 | $41^{1}$ | 26.4 |  | 47 | 483 |  | 507 | 519 | 531 | 543 | 55 | 48 |
| 50 | 0912 | 0834 | 0755 | 0677 | 0598 | 0520 | 0441 | 03 | 0283 | 42．0205 | 26.9875 | 99 | －12 | 024 |  | 048 | 061 | 073 | 085 | S | 50 |
| 51 | 9331 | 9251 | 917 | 9090 |  |  |  |  | 868 | 42：860 | $27 \cdot 5273$ |  |  |  |  |  |  |  |  |  |  |
| 52 | 774 | 7667 | 7586 | 75 | 7422 | 7340 | 72 | 7177 | 595 | $43 \cdot 70$ | 28.067 |  |  | 1052 |  | 130 |  |  |  |  | 52 |
| 53 | 6167 | 6084 | 6001 | 5917 |  |  |  |  |  | 44. | 28 | 61 | 63 | 64 | 65 | 67 | 68 | 69 |  | 7 | 53 |
| 54 | 4585 | 4501 | 4416 | 331 |  | 41 |  |  | 3906 | 5 |  |  |  | 18 | 19 | 212 | 225 | 23 | 2522 |  | 54 |
| 55 | 3004 | 2917 | 283 | 2744 |  | 25 | 248 | 2398 | 2312 | $46 \cdot 2225$ | 29.58 |  |  |  |  | 7536 | 7671 | 7805 |  |  | 55 |
| 56 | 142 | 1334 | 124 | 1158 |  | 09 |  |  | 0717 |  | 30.2260 |  |  |  |  |  |  |  |  |  |  |
| 57 |  |  |  | 9572 |  |  |  |  | 9123 |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 825 | 81 | 8076 | 79 |  |  | 7711 | 7620 | 529 | 48.743 | 31 |  |  |  |  | 376 | 39 |  |  |  |  |
| 59 | 66 |  | 649 | 63 |  |  |  | 27 | 5934 | 49. |  |  | 87 | 88 |  | 917 | 9319 | 946 | 960 | 975 |  |
| 60 | 50 | 5001 | 4906 | 4812 | 4718 | 4623 | 4529 | 34 | 4340 | 50．4245 | $32 \cdot 3850$ | 399 | 4144 | 429 | 443 | 458 | 473 | 487 | 502 | 517 | 60 |
| 61 | 35 |  |  |  |  |  |  |  |  | 51.264 |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 193 | 183 | 173 | 16 | 15 | 14 | 1347 | 1249 | 115 | $52 \cdot 10$ |  |  |  |  |  |  |  |  |  |  | 62 |
| 63 | 03 | 02 | 0152 | －0 |  |  |  |  | 9557 | 52.94 | 34.004 | 0197 |  | 05 |  | 08 | 096 | 112 | 12 | 14 |  |
| 64 | 8768 | 8667 | 8567 | 8466 | 8366 | 826 | 81 | 8063 | 7963 |  |  |  |  |  |  | 62 | 638 |  |  |  |  |
| 65 | 718 | 70 | 6982 |  | 67 | 66 | 6573 | 6471 | 6368 | 54．626 | 35.083 | 099 |  |  |  | 163 |  |  |  |  |  |
| 66 | 560 |  | 5397 |  |  |  | 498 | 487 | 4774 |  |  | 639 |  | 67 | 688 | 70 | 720 | 736 |  |  | 66 |
|  |  |  |  |  |  |  |  | 3285 | 1 | 56.307 |  |  |  |  |  |  | 26 |  |  |  |  |
| 68 | 24 | 23 | 2227 | 2120 | 2013 | 19 | 1799 | 1692 |  | 57.14 |  |  |  |  |  |  |  |  |  |  |  |
| 69 |  |  |  | 0534 |  |  | 208 | ＋100 |  | 57．9882 | 37．2428 | 259 | 27 | 29 | 310 | 327 | 34 | 36 |  |  |  |
| 70 | 927 |  |  |  |  | 872 |  |  | 8397 |  | $37 \cdot 7825$ | 799 | 276 | 83 | 85 | － |  | 902 | 9196 | 936 | 70 |
| 71 | 7696 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 611 | 6001 | 588 | 5775 | 56 | 55 | 5435 | 5321 | 5208 | $60 \cdot 509$ |  |  |  |  |  |  |  |  |  |  | 72 |
| 7 | 453 | 4418 | 4318 | 4188 | 407 |  |  | 3729 | 361 | 61349 | $39 \cdot 401$ | 419 | 437 | 45 | 473 | 491 | 509 | 526 | 54 | 56 | 73 |
| 74 | 295 | 2834 | 2718 | 2602 |  |  |  |  |  | 62.1903 | 30 | 959 | 977 |  |  | 032 | 050 |  |  |  |  |
| 75 | 13 | 12 | 1133 | 1015 |  | 077 |  | 0543 | 0425 | 63.030 | $40 \cdot 481$ | 499 | 518 | 536 | 55 | 573 | 591 | ¢ |  |  |  |
| 76 | 97 | 9668 | 9548 | 9429 |  |  | 9070 | 8950 | 831 | $63 \cdot 8$ | 41.021 | 039 |  | 076 | 095 | 114 | 132 | 15 | 169 | 183 | 76 |
| 78 |  | 8084 |  |  |  |  |  |  | 7236 | － 7 | $41 \cdot 560$ | 579 |  | 6174 | 6362 | 655 | 673 |  |  |  |  |
| 78 | 6623 | 6501 | 6378 | 62 | 6133 | 6010 | 5888 | 5765 | 5642 | 65.5519 | $42 \cdot 100$ | 119 | 138 | 1578 | 1769 | 1960 | 215 | 7 |  |  |  |
| 79 | 50 | 4918 | 4794 |  | 4545 | － | 4296 | 4172 | 4048 | $66 \cdot 3923$ | 42.6403 | 659 | 6790 | 6983 | 717 | 737 | 756 | 775 | 79 | 814 |  |
| 80 | 3460 | 3334 | 3209 | 3083 | 2957 | 283 | 2705 |  | 2453 | 2327 | $43 \cdot 1801$ | 1996 | 19 | 源 | 258 | 278 | 297 | 317 | 33 | ， | 80 |
| 81 | 1878 | 1751 | 1624 | 1496 | 1369 | 12 | ， | 937 | 085 |  |  | 硡 |  |  |  |  |  |  |  |  |  |
| 82 | 029 | 01 | ＋03 | 9910 | 97 | 96 | 95 | 9394 | 9265 | 68.913 | 44.25 | 279 | 299 | 3198 | 339 | 359 | 380 | 400 | 420 |  | 82 |
|  | 71 | 8584 | 4 |  | － |  | 632 | 201 | 76070 |  | 44.799 | 819 | 839 | 860 | 8806 | 900 | 92 | 94 | 961 | 982 |  |
| 84 | 713 | 7001 | 686 | 673 | 660 | 647 | 634 | 6208 | 6076 | 70.5944 |  | 35 | 380 | 400 | 42 | 4419 | 46 | 483 |  |  | 84 |
| 85 | 55 | 54 | 5284 | 5151 | 5017 | 4883 | 4749 | 4615 | 4482 | 71.4348 | 45.8 |  |  | 9412 | 9620 | 98 | ＋03 | 024 | 04 |  |  |
| 86 | 39 | 3834 |  |  |  |  |  | 3023 | 2887 | － | 46.418 | 439 |  | 4817 | 5028 | 523 | 544 | 5659 |  |  | 86 |
| 87 | 2388 | 2251 | 2114 | 矿 | 182 | 17 | 1597 | ， | 128） |  | 46 | 979 |  | 222 | 0435 | O64 | O86 | （1） |  |  |  |
| 88 | 080 | 066 | 053 | 03 | 025 | 1 | 997 | 9837 | 969 | 73.956 | 47＊4981 | 519 | 54 | 56 | 5842 | 60 | 627 | 648 | 6703 | 69 | 88 |
|  | 924 | 758 |  |  |  | 852 | 8385 | 244 | 104 |  | 037 | 059 | 081 | 103 | 125 | 1467 | 168 | 1903 | 1 |  | 89 |
| 90 | 7642 | 7501 | 7360 | 7218 | 7077 | 6935 | 6793 | 6652 | 6510 | 56368 | $48 \cdot 577$ | 5996 | 621 | 643 | 665 | 687 | 709 | 731 | 753 | 7757 | 90 |
| 91 | 60 | 5918 | 5775 | 5632 | 548 | 53 | 202 | 059 | 4916 | $76^{\prime} 477$ | 49．117 | 139 | 16 | 841 | 2064 | 287 | 2509 | 273 |  |  |  |
| 92 | 447 | 4334 | 4190 | 4045 | 3901 | 3756 | 3611 | 34 | 3321 | 77．3176 | $49 \cdot 657$ | 679 |  | 72 | 74 | 76 | 792 | 81 | 8372 |  | 92 |
| 93 | 289 | 27 | 2 | 2459 | 2313 | 27 | 2020 | 1873 | 1727 | 58 | 50 | 75 | 24 | 265 | 287 | 310 | 333 | 3561 |  |  |  |
| 94 | 131 | 11 | 1020 | 0872 | 0725 | 0577 |  | 0281 | ＋133 | 78.998 | 50.736 | 759 |  | 805 | 828 | 851 | 874 | 897 | 920 |  | 9 |
| 95 | 9734 |  |  |  | 9136 | 8987 |  |  |  | 79．8389 | 51.276 | 299 | 32 | 3461 | 369 | 392 | 415 | 439 | 4623 | 485 |  |
| 96 | 815 | 8001 | 7850 | 5699 | 5960 |  |  |  |  | 80 57 |  | 839 |  | 8866 | ， | 936 | 957 |  |  |  | 96 |
| 97 | 65 | 641 | 626 | 6113 | 5960 | 580 | 5655 | 5502 | 5350 | 81.5197 | 52－3558 | 3796 | 403 | 427 | 4508 | 475 | 498 | 220 | 545 |  | 97 |
| 98 | 4988 | 4835 | 46 | d | 4372 | 42 | 4064 | 3910 | 375 | 82.360 | $52 \cdot 8956$ | 9196 | 9435 | 967 | 9915 | －15 | 039 | 063 | 0874 |  | 98 |
|  |  | 3251 |  |  | 2784 | 263 | 2473 | 2317 |  | 83.2005 | 53.4353 | 4596 | 4838 | 5080 | 5323 | 5565 | 5807 | 604 | 229 | 6533 |  |
| 100 | 1825 | 1668 | 1511 | 1354 | 1196 | 1039 | 0882 | 0724 | 0567 | 84.0409 | 53.9751 | 9996 | － 240 | 0485 | 0730 | 0975 | 1219 | 1464 | 1708 | 1953 | 100 |
|  | $20^{\prime}$ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ | $13^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ | $20^{\prime}$ | 19 | $18^{\prime}$ | 17 | 16 | 15 | $14^{\prime}$ | 1 | $12^{\prime}$ | $11^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 57 |

TRAVERSE TABLES.


TRAVERSE TABLES.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3887 | ${ }^{8385}$ | ${ }^{8384}$ | 382 | 8380 | 8379 |  |  |  |  | . 5446 | 544 | 5451 | 5454 | 5456 |  |  |  |  |  |  |
|  | 577 |  | 676 |  |  |  |  |  |  |  |  | ${ }^{0898}$ |  |  | ${ }^{0368}$ | ${ }_{6376} 637$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 3502 |  |  |  |  | 1825 |  |  |  | 1845 | 18 |  |  |  |
|  |  |  |  |  | 0282 | 027 | ${ }_{0263}$ |  | 024 | 5.02 | ${ }^{32678}$ | 269 | 2708 | 2722 | 273 | 2751 | 2766 |  |  |  |  |
|  |  | 86 | 86 |  |  |  | 8840 |  |  |  |  | 8142 |  |  | 8193 |  | ${ }_{8227} 88$ | 46 | 8261 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 361 | 9083 |  |  |  |  | 919 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4561 | 458 |  | 635 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{\circ}$ | ${ }^{20}$ | 8985 |  |  | ${ }_{850}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 642 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{7298}$ |  |  | 7415 |  |  |  |
|  | 2574 | 25 | 25 | 2493 | 2466 |  | 24 |  | 2358 |  |  |  |  | 2713 |  |  |  | 2878 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 |  | 60 | 60 | 6022 |  |  |  |  | 58 |  |  | 4225 | 77 | ${ }^{4528}$ |  |  | 468 | 233 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $23.23$ |  | 12 |  | 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{27}^{26}$ | 805 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{28} 28$ | 438 | 47 | ${ }^{4}$ | 46 | 4850 | 450 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9988 |  |  |  |  |  |  |  | 959 |  |  | 8914 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{4363}$ |  |  |  |  |  |  |  |  |  |
|  | 5148 | 50 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{38}$ | 8695 | ${ }^{0} 8$ | 85 | 851 | 84 | ${ }_{839}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 546 |  |  |  |  | ${ }_{\text {ctic }}^{615}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 88 |  |  | 859 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 46 |  | 571 | 56 | 557 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{48}^{47}$ |  |  |  | ${ }_{23} 39$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{50}^{49}$ |  |  | 1079 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7722 |  |  |  |  |  | 72 | 75 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 6429 | 63 | 62 | 615 |  | 596 | 587 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 47 | 46 | 2914 |  |  | 4254 |  |  |  |  |  |  |  |  |  |  | 7807 |  |  |  |
|  | 1589 | 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8362 |  |  |  |  |  |  |  |  |  |  |  | 3430 |  |  |  |  | 4198 |  |  |  |
|  |  |  | ${ }_{4}^{653}$ | ${ }_{482}^{644}$ | ${ }^{633} 472$ | ${ }_{462}^{622}$ | ${ }_{4} 619$ |  | ${ }_{431}^{593}$ |  |  |  | ${ }_{4332}^{8881}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 681 |  |  |  |  |
| 70 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 73 | 2230 |  |  | 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }_{88}^{04}$ |  | O264 |  | ${ }_{840}$ |  |  | ${ }_{805}^{967}$ |  | $40 \cdot 8$ |  |  |  |  |  |  |  |  |  |  |
|  | 7390 |  |  |  |  |  | 666 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 167 | 154 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 7320 | 7190 | 78 | 69 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 245 |  | ${ }^{286}$ |  |  |  |  |  |  |
|  | ${ }_{287}$ |  |  | 24 | 23 | 19 |  |  | 179 | 171 | ${ }^{6} 2$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 538 |  |  |  |  |  |  |  |
|  | 884 | 466 | 451 |  |  |  |  |  |  |  |  |  | 061 |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 26/3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 148 | 12 | 9521 | 9374 | 92 | dor |  |  |  |  |  | 99 |  |  |  |  |  |  |  |  |
|  |  | ${ }^{820}$ | 805 |  | 775 | 760 | 755 | $\left.\right\|_{568} ^{7300}$ | 715 | 78 |  | 218 | 2419 | 264 |  |  | 33 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 189 |  | 158 | 143 | 12 | 12 |  |  | 065 |  |  | 39 | 42 | 4663 |  |  |  |  |  |  |  |
|  | 2084 | 851 | 8354 | 3195 | ${ }^{036}$ | 878 | 771 |  | ${ }_{740} 9$ | 3/242 | 463 | 483 | 12 | 537 | ${ }^{175}$ | 585 | (104 | 6346 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## TRAVERSE TABLES．

| 33 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $33^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ |  | $12^{\prime}$ | 13 | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ | 17 | 18 | 19 | $10^{\prime}$ | $1{ }^{\prime}$ | 12 | 13 | 14 | 15 | $16^{\prime}$ | 17 | 18＇ |  |  |
|  | 8371 | 8369 | 83 |  |  | 83 | 8361 |  | 8358 | 析 | 547 | 5473 | 5476 | 5478 | 5480 | 5483 | 5485 | 5488 | 5490 |  |  |
| 2 |  | 6738 | 67 | 67 | 6729 | 67 | 6723 |  | 67 | 671 | 094 | 0946 | 0951 |  | － | 09 | 0971 | 0976 | 0980 |  |  |
|  | 511 | 5108 | 510 | 50 |  |  | 5084 | 519 | 507 |  | $1 \cdot 6412$ |  |  |  |  |  |  | 6463 |  |  |  |
|  | 348 | 3477 | 347 | 3464 | 588 |  | 344 | 3439 | 3432 | 析 | 2.1883 | 1893 | 1903 | 1912 | 1922 | 1932 | 1941 | 1951 | 1961 |  |  |
| 5 | 1854 |  |  |  |  |  |  | 1798 | 1790 | $4 \cdot 178$ | 27354 | 7366 | 7378 | 73 | 7402 | 15 | 7427 | 7439 | 7451 | 46 |  |
| 6 | 0225 | 0215 | 0206 | 0196 | 0187 | 0177 |  | 0158 | 0148 | ．0139 | $3 \cdot 2825$ | 2839 | 2854 | 2868 | 2883 | 2898 | 2912 | 2927 |  |  |  |
|  | 859 | 858 | 857 | 85 | 8551 | 8540 | 8529 |  |  |  |  |  |  | 8346 |  | 8381 | 8398 | 4， 27 | 8432 |  |  |
|  | 69 | 695 | 69 | 6928 | 6916 |  | 689 | 687 | 68 | \％85 | 437 | 37 | 380 | 3825 | 38 | 3863 | 3883 | 390 | 3922 |  |  |
|  | 5337 | 5323 |  |  |  |  |  |  |  |  | －92 | 9259 | 92 | 9303 | 93 |  | 9368 | 93 | 9412 |  |  |
| 10 | 3708 | 3692 | 3676 | 3661 | 3645 | 3629 | 3613 | 929 | 581 | 8.356 | 5． 4708 | 4732 | 475 | 47 | 48 | 4829 | 485 | 487 | 49 | 4927 | 0 |
|  | 2079 | 2062 | 2044 | 2027 | 2009 | 1991 | 1974 | 1956 | 1939 | 9．1921 | 6.0178 | 0205 | 0232 | 025 | 0285 | 0312 | 0339 | 0366 | 0393 | 0419 | 1 |
| 12 |  | 043 |  |  |  | 0354 | 033 |  |  | 10 |  |  |  |  |  | 57 |  |  |  |  | 12 |
| 13 | 8821 | 8800 |  |  |  | 8717 | 8696 |  |  |  |  |  |  | 1215 | 12 | 1278 | 1310 | 1341 | 1373 | 140 | 13 |
| 14 | 7192 | 7169 | 714 |  | 7102 | 7080 | 7058 | 7035 | 7013 | 11. | 7659 | 6625 | 6659 | 66 | 6727 | 6761 | 6795 | 68 | 6863 | 6897 | 14 |
| 15 | 5562 |  |  |  |  |  |  |  |  | 12 | 8.2061 | 209 | 213 | 21 | 2207 | 2244 | 22 | 23. | 2353 | 2390 | 15 |
| 16 | 3933 | 3908 |  |  |  |  | 3780 |  |  |  |  |  |  |  |  |  |  |  |  |  | 16 |
| 17 | 230 | 227 | 225 | 2223 | 2196 |  | 2142 |  |  |  |  |  | 3086 |  |  |  |  | 3293 | 333 |  |  |
| 18 | 06 | 06 |  |  |  | 0532 | 0503 | 0474 | 0445 | 15.04 | － | 85 | 8561 | 86 | 86 | 86 | 87 | 8780 | 8824 | 886 | 18 |
| 19 | 9046 | 9015 |  |  |  |  | 8864 |  |  | 15.87 | 10.3 | 399 | 4037 | 40 | 41 | 4176 | 422 | 4268 | 4314 | 4361 |  |
| 20 | 7417 | 7385 | 7353 | 7321 | 7289 | 7257 | 7225 | 719 | 7161 | 16.71 | 10.9 | 9464 | 951 | 9561 |  | 659 | 9707 | 9756 | 9805 | 9853 | 20 |
| 21 | 57 | 5754 | 57 | 5687 | 5654 | 5620 | 5587 | 55 | 5520 | 17 | 11 | 4937 | 4988 | 5039 | 5090 | 5142 | 5193 | 5244 | 5295 | 5346 | 21 |
| 22 | 415 | 4123 |  |  |  |  |  |  |  |  |  | 04 | 04 |  |  |  |  |  |  |  | 22 |
| 23 | 2529 | 2492 | 245 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 633 | 23 |
| 24 | 09 | 086 | 082 | 0785 |  |  |  | 0632 | 0594 |  | 13.1 |  | 14 | 14 | 15 | 1590 | 164 |  | 1765 | 182 | 24 |
| 25 | 927 |  |  |  |  |  |  |  |  | 20 | 13.6 |  | 68 | 69 | 70 | 707 | 7134 | 7195 | 7256 | 7316 | 25 |
| 26 | 7642 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 6012 | 596 | 59 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | 43 | 433 | 42 | 4249 |  | 416 | 4115 |  | 4026 | 23 | 15 | 325 | 3318 |  | 3454 | 3522 | 359 | 3658 | 3726 | 379 | 28 |
| 29 | 275 |  |  |  |  | 252 |  |  |  | 24.23 |  | 87 |  |  | 8934 | 900 |  | 91 | 217 |  |  |
| 30 | 1125 | 107 | 10 | 82 | 34 | 0886 | 0838 | 079 | 0742 | 25 | 16.4123 | 419 | 42 | 4342 | 4415 | 448 | 456 |  | 4707 | 478 | 30 |
| 31 | 949 | 9446 | 9397 | 9348 | 9298 | 9249 | 9199 | 9150 | 9100 | 25.905 | 16.959 | 9669 | 9745 | 9820 | 9895 | 997 |  | 0122 |  |  | 31 |
| 32 | 786 |  |  |  |  |  |  |  |  |  | $17 \cdot 506$ | 514 |  |  |  |  |  |  |  |  | 32 |
| 33 | 6237 | 618 |  |  | 析 |  |  |  |  | $27 \cdot 57$ | 18.053 |  |  |  |  |  |  |  |  |  |  |
| 34 | 460 | 45 | 45 | 4446 | 392 | 4337 | 42 | 4229 | 4175 | 28 | 18. | 608 |  | 62 | 6337 | 6420 | 650 |  |  | 6750 |  |
| 35 | 2979 | 2923 | 286 | 2812 | 2756 | 2700 | 2644 | 2588 | 2533 | 29．2 | 19 | 1562 | 1647 | 17 | 181 | 1903 |  | 2073 | 2158 | 2243 | 35 |
| 36 | 13 |  |  |  |  |  |  |  |  | 30.08 | 19．6947 |  |  |  | 7298 |  |  |  |  |  | 36 |
| 37 | 972 | 96 |  |  |  |  |  |  |  | 30．91 | $20 \cdot 24$ |  |  |  |  |  |  |  |  |  |  |
| 38 | 809 | 80 | 7970 | 7910 |  | 778 | 7728 |  | 760 | 31 |  | 79 | 8074 |  | 8259 | 835 | 844 |  | 8629 | 872 |  |
| 39 | 6462 | 64 |  |  |  |  |  |  | 5965 | 12 |  |  |  |  | 3739 | 3834 |  |  | 4119 | 4214 |  |
| 40 | 4833 | 47 | 4706 | 4642 | 4578 | 451 | 445 | 43 | 4323 | 3 4 | 21．883 |  |  |  | 22 |  |  |  |  | 9706 |  |
| 41 | 320 | 3139 | 307 | 3008 |  | 287 |  | 2746 | 2681 |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 157 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 994 |  |  | 9740 | 析 |  |  |  | 939 | 35．93 |  |  |  |  |  |  |  |  |  |  |  |
| 44 | 831 | 82 |  |  |  | 796 |  |  | 775 |  |  | 08 |  |  |  | 124 | 13 |  | 1570 |  | 4 |
| 45 | 668 |  |  |  |  |  | 6257 |  |  | 37 | 24 | 629 | ¢ |  |  |  |  |  |  | 7170 | 45 |
| 46 | 5058 | 4985 |  | 4838 |  |  |  |  |  | 38.439 | 25 |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 342 | 335 |  |  |  |  |  |  |  | 39.27 |  |  |  |  |  |  |  |  |  |  |  |
| 48 | 180 |  |  |  |  | 141 |  |  |  | $40^{\circ}$ |  | 27 |  |  |  | 318 | 32 |  |  |  |  |
| 49 | 01 |  |  |  |  |  |  |  |  | $40 \cdot$ |  |  |  |  |  | 861 |  |  |  |  |  |
| 50 | 854 | 846 |  |  |  | 8143 | 806 |  | 7904 | 41 | 27 | 366 | 3782 | 3903 | 4025 | 4147 | 426 | 439 | 451 | 463 | 50 |
| 51 | 691 | 683 |  |  |  | 65 | 64 |  | 626 | 42 | 27 |  | 92 |  |  | 963 |  |  |  |  |  |
| 52 | 52 | 52 | 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 365 | 35 |  |  |  |  |  |  | 2978 |  |  |  |  |  |  |  |  |  |  |  |  |
| 54 | 202 |  | 18 |  |  | 15 |  |  | 133 | $45 \cdot 12$ |  | 55 |  | 58 | 59 | 607 | 62 | 63 | 6472 | 661 |  |
| 55 | 0395 | 03 | 022 |  | ＋045 |  | 9870 | 978 | 969 | $45^{\prime} 96$ | 30 | 102 |  |  | 142 | 156 |  |  |  |  | 55 |
| 56 | 8766 | 8677 |  |  |  |  |  |  |  | 46796 |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 71 | 704 | 69 | 6865 | 6774 |  |  |  |  | $47 \cdot 63$ |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 55 | 54 | 53 |  |  |  |  |  | 47 | 48.46 |  |  |  |  |  | 80 | 81 | 82 |  | 857 |  |
| 59 | 387 |  |  |  |  |  |  |  | 126 | 19．30 |  |  |  |  | 33 | 349 |  |  |  |  |  |
| 60 | 22 | 2154 | 2059 | 1963 | 1867 | 1772 | 167 |  | 1484 | 50．1389 | 32 | 839 | 8538 |  | 883 | 897 | 912 | 9268 | 9414 | 956 | 60 |
| 61 | 062 | 052 |  | 032 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 899 |  |  |  |  |  |  |  |  | 51 |  |  |  |  |  |  |  |  |  |  |  |
|  | 736 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 64 | 5733 | 563 |  | 5427 | 5325 |  | 512 |  |  | 53.4 |  |  |  |  |  |  |  | 12 | 1375 | 153 |  |
| 65 | 410 |  |  |  |  |  |  |  | 327 | 54317 | 35.56 |  |  |  |  |  |  |  |  | 702 | 65 |
| 66 | 247 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 92 | 910 |  | 889 |  | 86 |  |  | 834 | 56.82 | 37 | 217 | 23 | 25 | 26 | 283 | 300 |  |  |  |  |
| 69 |  |  |  |  |  |  |  |  |  |  |  | 位 |  |  |  | 研 |  |  |  |  | 69 |
| 70 | 59 | 584 | 5735 | 5624 | 5512 | 5400 | 528 | 517 | 506 | 58.4953 | 38．2953 | 312 |  |  |  | 380 | 397 | 4146 | 4316 | 44 | 70 |
| 71 | 432 | 421 | 4103 |  | 3876 | 37 | 365 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 27 | 25 |  | 2356 | 22 | 21 | 2011 | 189 | 178 | 60．16 | 39＇3895 | 40 | 42 | 44 |  |  | 仡 |  | 529 | 54， | 72 |
| 73 | 1070 |  |  |  |  |  |  |  | d | 61.002 |  | 9543 |  |  |  | 025 |  |  |  |  |  |
| 74 | 9441 | 93 | 920 |  | 89 | 8852 | 87 | 86 | 8497 | 61 ＇837 | $40 \cdot 4$ | 501 | 5197 | 53 | 555 | 573 | 591 | 609 | 627 | 645 | 74 |
| 75 | 7812 |  |  |  | 7334 | 7215 |  |  | 6856 | 62．673 | 41.0307 | 049 | 0 | 085 | 1037 | 122 | 14 | 158 | 176 | 194 | 75 |
| 76 | 6183 | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  | 670 |  |  |  |  | 76 |
| 77 | 45 | 44 | 430 |  | 4063 |  |  |  |  | 64．3 |  |  |  |  |  | ， | 237 |  |  |  |  |
| 78 | 292 | 28 | 267 | 2552 | 2428 | 2303 | 217 | 205 | 193 | 65.180 | 42.67 | 690 | 709 | 728 | 747 | 766 | 785 | 804 | 823 | 84 | 78 |
| 79 | 1295 |  |  |  |  |  |  |  | 228 | 66.016 |  | 238 | 257 | 276 | 295 | 315 | 334 | 3536 | \％ | 392 | 79 |
| 80 | 9666 | 953 | 9411 | 9284 | 56 | 029 | 89 | 8774 | 864 | 66 |  | 785 | 805 | 827 | 844 | 863 | 882 |  |  |  | 80 |
| 81 | 80 | 790 | 77 |  | 7521 | 739 | 26 |  | 53 |  |  |  | 硡 | 硡 | ， |  |  |  |  |  |  |
| 8 | 64 | 627 | 61 | 6016 | 588 | 57 | 56 | 549 | 536 | 68．52 | 44.860 | 880 | 900 | 92 | 940 | 960 | 980 | 920 | ， | 硣 | 82 |
| 83 | 478 | 4647 |  |  | 425 | 418 |  |  | 378 | 69．358 |  | 4275 | 仿 | 4015 | 4881 | 5083 | 5285 | 548 |  |  |  |
| 84 | 3149 | 301 | 28 | 27 | 26 | 248 | 234 | 2212 | 2078 | $70^{19}$ | 45.954 | 974 | 995 | ＋15 | 0362 | 056 | 077 | 097 | 11 |  | 84 |
| 85 | 1520 |  |  |  |  |  |  | 0572 | 0436 | 71.0300 | 46 | 522 | 542 | 563 | 58 |  | 62 | 646 | 66 |  |  |
| 86 | 9891 | 9754 |  |  |  |  |  | 硣 |  | 71.8657 | 47.0486 | 065 |  | 174 | 132 |  | 17 |  |  |  |  |
| 87 | 826 | 812 | 798 | 78. | 170 |  | 7430 | 729 | 矿 |  |  | 616 |  | 6592 | 688 | 7015 | 727 | 7638 |  |  |  |
| 88 | 663 | 649 | 635 | 621 | 6072 | 593 | 579 | 565 | 551 | 73.537 | 48.14 | 1641 | 18 | 207 | 228 | 249 | 271 | 292 | 31 | 335 |  |
| 89 | 5004 | 4862 | 4 2 |  | \％ | 205 | 4153 | 401 | 3869 | 37 |  | 711 | 研 | 54 | 析 | 798 | 19 | 31 | 8630 |  |  |
| 90 | 3374 | 3231 | 3088 | 2945 | 801 | 2658 |  | 2370 | 2227 | 75．2083 | 49 | 2588 | 280 |  | 245 | 46 | 368 | 390 | 析 | 433 | 90 |
| 9 | 1745 | 160 | 1456 | 11 | 1165 | 1020 | 0875 | 0730 | 0585 |  |  | 806 | 828 |  | 872 | 894 | 析 | 3 |  |  |  |
| 92 | ＋11 | 997 | 9823 | 9677 | 9530 | 938 | 9236 |  | 8943 | 76.879 | 50：33 | 353 | 375 | 39 | 42 | 44.3 | 46 | 48 |  |  | 92 |
| 93 | 848 | 833 | 8 |  | 785 | 7746 | 7598 | 析 | 7301 |  | $50 \cdot 878$ | 900 | 23 | 946 | 968 | 9913 | 139 | 析 | 硣 |  | 93 |
| 94 | 685 | 670 | 65 | 6409 | 6259 | 6109 | 595 | 580 | 5659 | 78.55 | 51.4252 | 4481 | 470 | 49 | 51 | 538 | 5624 | 585 | 608 |  |  |
| 95 | 522 | 50 |  | 477 | 4623 | 4472 | 4320 | 4169 | 4017 | 79.386 | 51.9722 | 9954 | ＋18 | 041 | 0647 | 0879 | 11 | 1341 | 1572 |  | 95 |
| 96 | 3599 | 3447 | 1681 |  |  | 2835 | 2682 |  |  |  |  |  | S66 |  | 6 | ， | 6ss |  | 7062 |  | 96 |
| 97 | 197 | 18 |  |  | 1352 | 1198 | 1043 | 0888 | （1） | 858 | 53.066 | 0900 | 181 | 1 | 16 | 184 | 75080 | 23 | 2552 | 278 | 97 |
|  | 0341 | 0185 | ＋029 | 98 | 9717 | 9560 | 9404 | 9248 | 909 | 81．8935 | 53.6135 | 6373 | 66 | 68 | 70 | 73 | 756 |  | 8042 | 8281 | 98 |
|  | 8712 | 8554 |  | 905 | \％ | 23 | 775 | 7607 | 7449 | 82.7291 | 54.1606 | 1847 | 2088 | 2329 | 2569 | 2810 | 3051 | 3292 |  |  | 99 |
| 100 | 7083 | 6924 | 6764 | 6605 | 6446 | 6286 | 6127 | 5967 | 5807 | 83.5648 | 54.7076 | 7320 | 7563 | 7807 | 8050 | 8293 | 8537 | 3780 | 023 | 266 | 100 |
|  | $50^{\prime}$ | 49 | $48^{\prime}$ | 47 | 46 | 45 | 44 | 43 | 42 | $41^{\prime}$ | co | 49＇ | 48 | $47^{\prime}$ | $46^{\prime}$ | 45 | $44^{\prime}$ | $43^{\prime}$ |  | $41^{\prime}$ |  |
| 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| 33 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $33^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | $34^{\prime}$ | $35^{\prime}$ | 36＇ | $37^{\prime}$ | 38＇ | $39^{\prime}$ | $30^{\prime}$ ！ | $31^{\prime}$ | ｜ $32 \times$ | ｜ 331 | $34^{\prime}$ | $\mid 35^{\prime}$｜ | $36^{\prime \prime}$ | ｜ 37 | ｜ $388^{\prime}$｜ | $39^{\prime}$ |  |
|  | 8339 | 833 | 8336 |  | 8332 | 8331 | 8329 | 8328 | 326 | ${ }^{8324}$ | 55 | 5522 | 5524 | 5527 | 5529 | 5531 | 5534 | 5536 | 5539 | 5 | 1 |
| 2 |  |  |  |  |  | 6662 |  |  |  | d | 103 | 104 | 104 | 1053 |  | 1063 |  | 1073 | 寿 |  |  |
| 3 |  | 5012 |  |  | 49 |  |  |  |  |  |  | d | 6573 | 658 | 658 | 659 | 6602 | 660 | 6616 | 62 |  |
|  |  | 3349 | 3 |  |  |  | 3317 |  |  | 329 | ．207 | 208 | 209 | 210 | 2116 | 212 | 2136 | 2145 | 2155 |  |  |
| 5 | 1694 | 1686 |  | 1670 | 62 | 54 | 1646 | 1638 | 1630 | $4 \cdot 1622$ | 2.7597 | 7609 | 7621 | 7633 | 7645 | 7657 | 7670 | 7682 | 7694 |  |  |
| 6 | 0033 | 0024 | 0014 | 1004 | 9995 | 9985 | 9975 | 9966 |  | 4.9946 |  |  |  |  | 3174 | 3189 | 3203 | 3218 | 3233 |  |  |
| 7 |  |  |  |  |  |  |  | 8293 |  |  |  | 8653 | 86 | 868 | 870 | 87 | B737 | 8754 | 8771 |  |  |
|  | 6711 | 6698 | 6685 |  |  | 6647 | 6634 | 6621 | 6608 | 6.659 | 4155 | 4174 | 419 | 421 | 4233 | 425 | 42 | 4291 | 4310 |  |  |
| 9 | 5050 |  |  |  |  |  |  | 4948 |  |  |  | 9696 | 97 | 97 |  | 978 | 9805 | 9827 | 884 | 987 |  |
| 10 |  |  |  |  |  |  |  |  |  |  |  | 5218 | 5242 | 5266 | 5291 | 53 | 5339 | 536 | 5388 | 5412 | 0 |
| 11 | 1727 | 1710 | 1692 | 1674 |  |  |  | 1604 | 1586 | 9．1568 | ． 0713 | 0740 | 766 | 793 | 0820 | 0846 | 0873 | 0900 | 0926 | 095 | ， |
| 12 | 00 | 0047 | 0 | －008 | 998 | 997 | 995 | 993 | 991 |  |  |  |  |  |  |  |  | 6436 | 6465 |  | 12 |
| 13 | 8405 | 8384 |  |  |  |  |  |  |  | 1 |  |  | 1815 | 1846 | 18 | 19 | 1941 | 197 | 200 | 203 | 13 |
| 14 | 67 | 6722 |  |  |  | 663 |  |  | 6564 | 11.65 | 7271 | 7305 | 7339 | 7373 | 74 | 7441 | 7475 | 750 | 7543 |  |  |
| 15 | 50 | 505 | 503 | 501 | 4986 | 4962 | 4938 | 4914 |  | ． 86 | 279 | 2827 | 286 | 290 | 29 | 297 | 3009 | 304 | 3081 | 3118 | 15 |
| 16 | 3422 | 3396 | 3370 | 3345 | 3319 | 3293 | 3267 | 3242 | 3216 |  | 8.8310 |  |  |  |  |  |  |  |  |  | 16 |
|  |  |  |  |  |  | 1624 |  |  | 1542 |  |  |  | 3912 |  |  | 4035 |  | 411 |  |  | 17 |
| 18 | 0099 | 007 | 00 | －01．3 | 9984 | 9955 | 9926 | 989 | 9868 |  |  |  |  |  |  |  | 9610 | 9654 |  |  | 18 |
| 19 | 84 | 8408 |  |  |  |  |  |  |  | 15 | ， 4 | 4914 | 4960 | 5006 | 5052 |  | 5144 | 5190 | 5236 |  |  |
| 20 |  |  |  |  |  |  |  |  |  |  | 03 | 0436 | 0484 | 0533 | 058 | 063 | 0678 | 072 | 0775 | 0824 | 20 |
| 21 | 5116 | 5082 | 5049 |  |  |  |  | 4880 | 4846 | 17.4812 | 11.5907 | 5958 | 600 | 606 | 6110 | 6161 | 62 | 6263 | 6314 | 636 | 21 |
| 22 | 34 | 3420 | 3384 | 33 | 3313 | 327 | 3243 |  | 3172 |  | 12 |  | 153 |  |  |  |  |  |  |  | 2 |
| 23 |  |  |  |  |  |  | 1572 |  |  | 19.14 | 12 | 7001 | 7057 | 7113 |  | 7224 | 7280 | 7336 | 7391 | 44 |  |
| 24 | 013 | 00 | 0056 |  | 9978 | 9940 | 990 | 9862 | 9824 | 19.97 |  | 252 |  | 2639 | 2698 | 2756 | 2814 | 2872 |  | 298 | 24 |
| 25 | 847 | 84 | 839 |  |  |  | 8230 | 8190 | 8150 | 20.8110 | $13 \cdot 7984$ | 8045 | 8106 | 8166 | 8227 | 8287 | 8348 | 8408 | 3469 | 8530 | 25 |
| 26 | 6810 | 6769 | 6727 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
|  |  |  |  |  |  |  |  |  |  |  | 14.9023 |  |  | 92 |  |  |  |  |  |  |  |
| 28 | 3488 | 344 | 339 | 3353 | 3308 | 3263 | 32 | 317 | 3128 |  | 15.4542 | 4610 | 467 | 47 | 4814 | 4882 | 4950 | 5017 | 5085 |  | 28 |
| 29 | 1827 |  |  |  |  |  |  |  | 1454 | 24.140 | 16.0062 | 0132 | 020 | 027 | 0343 |  |  |  |  |  | 碞 |
| 30 | － |  |  |  |  |  |  |  |  |  |  | 54 | 572 | 579 | 5872 | 5945 | 6017 | 析 | 6163 | 623 | 30 |
| 31 | 850 |  |  |  |  |  |  |  |  | 25.805 | 17.1100 | 1176 | 125 | 132 | 140 | 147 | 155 | 162 | 1702 | 77 | 31 |
| 32 | 68 | 67 |  |  | 6638 | 658 | 65 |  |  |  |  |  |  |  |  |  |  |  |  |  | 32 |
|  | 518 | 51 | 5076 |  |  | 4917 |  | 4811 | 4758 | 27.47 | 18.2139 | 2219 |  |  |  |  |  |  |  |  | 33 |
| 3 | 352 |  | 3412 | 335 |  | 3248 | 3193 | 3138 | 3084 | $28 \cdot 3$ | 18 |  | 782 |  | 7988 |  | 815 | 8235 | 8318 | 840 | 34 |
| 35 | 186 | 180 | 1748 |  |  | 157 | 1522 |  | 1410 | $29 \cdot 13$ | 19 | 3263 |  | 3433 | 3517 | 3602 |  | 37 | 3857 | 394 | 35 |
| 36 | 0199 | 0141 | 0083 | ｜ 025 | 9967 | 9910 | 9852 | 9794 | 9736 | 29.967 | 19.869 |  |  |  |  |  |  |  |  |  | 36 |
|  | 85 |  |  |  |  |  |  | 8121 | 8062 | 30．800 |  |  |  |  |  |  |  |  |  |  |  |
| 3 | 68 | 68 |  | 669 | 6632 | 657 | 651 | 6449 | 638 | 31.63 |  |  |  |  | 0105 |  |  |  | 0473 |  | 38 |
| 39 | 52 | 5153 |  |  |  |  |  |  | 4714 | 32.46 | 21.5255 |  |  |  | 5634 |  |  | 5917 |  |  | 3 |
| 40 | 3554 | 349 | 3426 | 3362 | 3297 | 3233 |  | 3104 | 3040 | 33.2975 | $22^{\circ} 0775$ |  |  | 1066 |  | 260 | 135 | 145 | 550 | 6 | 40 |
| 41 | 189 | 182 |  |  |  |  |  |  |  |  | $22^{\prime} 6294$ |  |  |  |  |  |  |  |  |  | 41 |
| 4 | 023 | 016 | 0097 |  |  | 989 | 9827 |  |  |  |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 857 |  |  |  |  | 82 |  | 8087 |  | $35 \cdot 79$ | 23 | 7437 |  | 7646 | 750 | 7854 |  |  |  | 327 |  |
| 44 | 6910 | 683 | \％ |  |  | 655 |  | 414 | 6344 | 36.62 | 24 | 295 | 30 | 31 | 3279 |  | 349 | 359 |  |  | 4 |
| 45 | 524 |  |  |  |  | 488 | 48 | 42 |  | $37 \cdot 45$ | 24•837 | 84 | 85 | 86 | 8808 | 8917 | 90 | 913 | 9244 | 935 | 45 |
| 46 | 35 | 3514 | 3440 |  |  | 3218 | 3144 |  |  | 38．2921 | 25.3891 |  | 4114 | 422 | 433 | 4449 |  | 4672 |  |  | 46 |
|  |  |  |  |  |  |  |  |  |  |  | 25.9410 |  |  |  |  |  |  |  |  |  |  |
| 48 | 026 | 018 | 0111 |  | 99 | 987 |  | 9725 |  |  |  |  |  |  |  |  |  |  |  |  | 48 |
| 49 | 860 | 85 |  |  |  |  |  |  |  |  |  |  |  | 0806 | 0924 |  |  |  |  |  |  |
| 50 | 6943 | 6863 | 6782 | 6702 | 6622 | 6541 | 6461 | 6380 | 6300 | 41.6219 | 27－5969 |  | 6211 | 6332 | 6453 | 657 |  | 681 |  | 2059 | 5 |
| 51 | 52 | 5200 |  |  |  |  |  |  |  | 42.45 |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 36 | 35 |  |  |  |  |  |  |  | 43. |  |  |  |  |  |  |  |  |  |  | 52 |
|  | 19 | 18 |  |  | 1619 |  |  | 1363 | 1278 | ． 11 | 29.25 |  |  | 2912 | 3041 | 3169 |  |  |  | 368 |  |
|  | 0298 | 0212 | 0125 | ． 38 |  |  |  | 9691 |  | 44 |  |  |  | 84 |  | 87 |  |  |  | 922 |  |
| 55 | 863 |  |  |  |  |  |  |  |  | $45^{\circ} 784$ |  |  |  |  |  |  |  |  | 63 |  | 55 |
| 5 | 69 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 36 | 35 | 3467 |  | 3281 | 318 |  | 3001 |  | 48.28 | 32 |  |  |  |  |  |  |  |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  | $49 \cdot 1$ |  |  |  |  |  |  |  | 6644 |  |  |  |
| 60 | 03 | 0235 | 0139 |  |  |  | 9753 | 9656 |  | 49.946 | $33^{1 / 162}$ | 1308 | 1453 | 159 | 174 | 189 | 203 | 218 | 232 | 247 |  |
|  |  |  |  |  |  |  |  |  |  |  | 33．66 |  |  |  |  |  |  |  |  |  |  |
|  | 70 | 6910 | 6810 |  |  | 65 |  |  | 62 | ． 61 | 34＊22 |  |  |  | 280 |  |  | 325 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | －7721 |  |  |  |  |  |  |  |  |  |  |
| 6 | 368 | 3584 | 3481 |  |  |  |  | 2967 |  |  | $35 \cdot 32$ |  |  |  |  |  |  | 4326 | 448 |  |  |
| 65 | 20 |  |  |  |  |  | 1399 | 1294 |  | 54 | $35 \cdot 875$ | 89 |  | 9232 |  |  |  | 9862 | ＋019 | 017 |  |
|  | 03 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 70 | 69 | 6824 |  | 6605 | 64 | 386 | 627 | 616 | 6．60 | 37．53 |  |  | 58 | 597 | 610 |  |  | 663 | 680 |  |
| 69 |  |  |  |  |  |  |  |  | 4493 | 57 | 38.08 |  |  | 硣 | 1506 | ， |  | 2007 | 217 | 234 |  |
| 70 | 37 |  | 95 | 3383 | 3270 | 3158 |  | 2932 | 281 | 58.2 | $38^{\circ} 63$ |  |  |  |  |  |  |  | 771 |  |  |
| 71 | 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 039 | 0282 | 01 | ＋05 | 99 | 9819 | 9703 |  | 947 | 59.93 | $39 \cdot 73$ |  |  |  |  |  | 84 | 86 | 87 | 826 |  |
|  |  |  |  |  |  |  |  |  |  |  | ， |  |  |  | 析 |  |  | 415 | 432 | 450 |  |
| 74 | 7075 | 6957 | 68 | 67 | 66 | 6481 | 6362 | 6243 | 6123 | 61.60 | 40.8 | 861 | 879 | 8972 | 915 | 933 | 95 |  | 86 | ＋04 |  |
| 75 | 54 | 5294 | 5173 | 5053 | 4932 | 12 |  | 4570 | 4449 | $62 \cdot 43$ | 41．39 | 41 | 43 | 4498 | 4680 | 486 | 50 | 522 | 5407 | 558 |  |
| 76 | 37 |  |  |  |  |  |  |  | 2775 | 63.2653 | 41.94 | 9656 |  |  |  |  |  |  | 0946 |  |  |
|  | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 78 | 043 | 06 | 018 | ＋0 | 993 | 9804 | 9679 | 955 | 942 | 64＇930 | $43^{\circ} 05$ | 07 | 088 | 107 | 126 | 14 | 16 | 1834 | 202 | 221 |  |
|  | 8710 |  |  |  |  |  |  |  | 753 | 6576 | 43＇6030 | 6222 | 6413 | 660 | 679 | 6988 |  | 737 | 756 | 775 |  |
| 80 | 7109 | 6980 | 52 | 6723 | 6594 |  | 6337 | 6208 |  | 66.595 | 44．1550 | 17 |  | 213 | 232 | 251 | 2 |  |  | 329 |  |
| 81 | 5447 | 5317 | 5187 |  | 492 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 378 | 365 | 352 |  | 32 | 312 | 2995 | 286 | 273 | $68 \cdot 25$ | 45.258 | 278 | 2986 | 318 | 338 | 358 | 37 | 3981 | 417 | 4377 |  |
| 83 | 2125 | ， |  |  |  |  |  |  | 寿 |  |  |  | 8 | 871 | 891 | ， | 931 | 5 | 硣 | 991 |  |
| 8 | 0464 | 0329 | 019 | 4059 | 99 | 9789 | 9654 | 9519 | 938 | 69.9248 | $46 \cdot 36$ | 383 | 403 | 4238 | 444 | 46 | 48 | 5052 | 25 | 矿 |  |
| 85 | 8803 |  |  |  | 8257 |  | 7983 | 7846 | 7709 | 70．757 | 46.91 | 935 | 9559 | 976 | 997 | 117 | 038 | 0589 | 079 | 100 |  |
| 86 | 7142 |  |  |  |  |  |  | 6174 | 60 | 71.589 | 47－46 | 487 |  | 529 |  |  | 591 | 6125 | 633 | 654 |  |
| 87 | 548 | 53 | 52 | 539 | 32 | 41 | 29 | 201 | 26 | 72 |  |  | 607 | 0818 |  | 671 |  | 71 | 187 |  |  |
| 88 | 382 | 36 | 35 | 3395 | 325 | 31 | 297 | 2829 | 2687 | 73.25 | 48.57 | 59 | 613 | 63 | 655 | 677 | 698 | 719 | 741 | 762 |  |
| 8 | 2158 |  |  |  |  | 1443 | 300 | 157 | 013 | ， | 49．122 | 440 | 165 | 187 | 208 | 230 | 25 | 273 | 295 | 316 |  |
| 90 | 0497 | 53 | 208 | 1063 | 9919 | 9774 | 9629 | 948 | 9339 | 74.919 | ． 674 | 696 | 180 | 739 | 761 | 7834 |  | 827 | 848 | 870 |  |
| 91 | 8836 | 8690 | 8544 | 8397 | 825 | 8105 | 958 | 7812 |  |  |  |  | 270 |  | 314 |  | 3 | 380 |  |  |  |
|  | 715 | 7027 | 6879 |  | 6584 | 6436 | 6288 | 613 | 599 | $76 \cdot 58$ | 50.778 | 80 | 8228 | 845 | 867 | 889 | 912 | 9343 | St | 9 |  |
| 93 | 551 | 537 | 52 |  | 4918 |  | 4617 | 保 | 4317 |  | 330 | 352 |  | 3978 | 4203 | 2420 | 46 | 4879 | 5 | 硣 |  |
| 94 | 385 | 37 | 3551 |  | 32 | 309 | 2946 | 2795 | 2643 | 78．2492 | 51.882 | 904 | 927 | 950 | 973 | 996 | ， | 4 | 064 | 6， |  |
| 95 | 219 | 2039 | 1886 |  |  | 1428 |  | 1122 |  | 79．081 | $52 \% 340$ | 457 | 480 | 5031 | 526 | 549 | 572 | 595 | 618 | 641 |  |
| 96 | 0530 |  |  |  |  |  |  | 9450 |  |  |  |  | 0325 | 0558 | 079 | 1023 | 125 | 1488 | 1721 | 195 | 96 |
|  | 88 | 8713 |  | 8402 | 82 | 8090 | 7934 | \％ | 析 | 80746 |  |  | 5849 | 6085 | 632 | 205 |  | 7025 | 260 | 749 |  |
| 98 | 720 | 7051 | 6893 |  | 6578 | 6421 | 23 | 6105 | 594 | 81.5789 | 54.089 | 113 | 137 | 16 | 184 | 20 | 232 | 256 | 2798 | 303 |  |
|  | 5889 | 5388 | 565 |  | 32 | 475 | 4592 | 4433 | 4273 | 82.4114 | 54.6418 | 6658 | 6898 | 138 | 7378 | 7618 | 785 | 8097 | 8337 | 857 | 99 |
| 100 | 3886 | 3725 | 65 | 3404 | 3243 | 3082 | 2921 | 2760 | 2599 | 83.2438 | 55．1937 |  | 2422 | 2665 | 2907 | ， | 3392 | 3634 | 3876 | 471 | 90 |
|  | $30^{\prime}$ | $29^{\prime}$ | 28 | 27 | $26^{\prime}$ | 25 | $24^{\prime}$ | 23 | 22 | $21^{\prime}$ | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | 26 | $25^{\prime}$ | $4^{\circ}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| 33 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $33^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 50 | $51^{\prime}$ | $52^{i}$ | 53＇ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | 68 | 59 | $50^{\prime}$ | $51^{1}$ | $52^{\prime}$ | 53＇ | 54 | $55^{\prime}$ | $56^{\prime}$ | $57^{\prime}$ | $58^{\prime}$ | ${ }^{\text {c }}$ |  |
|  | 8307 | 8305 | 8303 | 8302 | 8300 | 8299 | 8297 | 8295 | 8294 | 829 | ． 5568 | 5570 | 5573 | 5575 | 5577 | 80 | 5582 | 5585 | 5587 | 5590 |  |
|  |  | 661 | 6607 | 6603 | 660 | 65 | 65 | 6591 |  |  | 1.1136 | 1140 | 11 | 11 | 1155 | 150 |  | 1169 | 117 |  |  |
|  |  |  | 4910 | 4905 | 4900 | 4896 | 4891 | 4886 | 488 |  |  | 67 |  |  | 6732 |  |  |  |  |  |  |
|  | 3226 |  | 3213 | 3207 | 3200 | 319 | 3188 | 318 | 3175 | 3.31 | 硣 | 228 |  |  |  |  |  |  |  |  |  |
|  | 1533 | 1525 | 1517 | 1509 | 1501 | 1493 | 1484 | 1476 | 468 | $4 \cdot 14$ | 2．7839 | 7851 | 7863 | 7875 | 7887 | 7899 | 7911 | 7923 | 7936 | 7948 |  |
|  | 9840 | 19830 | 982 | 981 | 980 | 97 | 978 | 19772 | 97 | 4.97 | 3.3407 | 3421 | 3436 | 3450 | 3465 | 3479 | 3494 | 35 | 35 | 3537 |  |
|  | 8146 | 8135 | 812 | 8112 | 810 | 8090 | 8078 | 8067 | 8055 | 5.80 | 3.8975 | 8991 | 9008 | 9025 | 9042 | 9059 | 9076 | 909 | 91 | 9127 |  |
|  | 6453 |  | 6427 |  | 6401 |  | 6375 | 6362 | 6349 | 6．633 | 4；4542 | 4562 | 4581 | 4600 | 20 | 339 | 4658 | 46 | 46 | 4716 |  |
|  |  |  |  |  |  |  | 4672 |  |  |  |  | 0132 |  | 0175 |  | 0219 |  | 0262 |  |  |  |
| 10 | 3066 | 3050 | 3034 |  | 3001 | 2985 | 2969 | 2953 | 2936 | 8.2920 | 5.5678 | 5702 | 57 | 57 | 5775 | 5799 | 5823 | 5847 | 5871 | 5895 |  |
| 11 | 1373 | 1355 |  |  |  |  | 1266 | 1248 |  | $9 \cdot 12$ |  |  |  |  |  |  |  |  |  |  |  |
| 12 | 19679 | 966 | 96 | 96 | 96 | 7582 | 9563 | 7543 |  |  |  |  | 24 |  | 2507 |  |  |  |  |  | 12 |
| 13 | 7986 | 7965 | 79 | 7923 | 7902 | 7881 | 7859 | 7838 | 7817 | 10.7796 | 7.2381 | 2413 | 2444 | 2475 | 2507 | ${ }^{2538}$ | 257 | 260 | 263 | 266 | 13 |
| 15 | 4599 | 4575 | 4550 | 4526 | 4502 | 4478 | 6156 4453 | 6134 4429 | 6111 4404 | 11.6088 124380 | 7．7949 | 7983 | $\begin{aligned} & 8017 \\ & 3589 \end{aligned}$ | $\left\lvert\, \begin{gathered} 8051 \\ 3626 \end{gathered}\right.$ | 8084 3662 | $\left\|\begin{array}{l} 8118 \\ 3698 \end{array}\right\|$ | $\left\lvert\, \begin{gathered} 8152 \\ 3734 \end{gathered}\right.$ | $\left\lvert\, \begin{aligned} & 8186 \\ & 3770 \end{aligned}\right.$ | $\begin{array}{\|l\|} 882 \\ 380 \end{array}$ | 8253 | 14 |
| 16 | 2906 | 288 | 28 | ${ }^{2828}$ | 280 | 27 | 275 | 2724 | 269 | 13.26 | S | 9123 | 62 | 9201 | 39 | 78 | 16 | 9355 | 9394 | 32 | 16 |
|  | 1212 | 118 | 1157 |  | 11 | 107 | 1047 | 1019 | 09 | 14.0 | 52 | 4694 | 4735 | 4776 | 4817 | 4858 | 4899 | 494 |  |  |  |
| 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 18 |
|  |  |  |  |  |  |  |  |  |  |  |  | 5834 |  |  | 5972 | 6017 |  |  |  |  | 19 |
| 20 |  |  |  |  | 6002 | 5970 | 5938 | 5905 | 5873 | $16 \cdot 5$ | 11.1356 | 140 | 1452 | 1501 | 1549 | 159 |  | 1694 |  | 179 |  |
| 21 | 4439 | 4405 | 4371 | 4337 |  |  | 4234 |  |  | 174132 | 11.6924 |  |  |  |  |  | 7228 |  |  |  | 21 |
| 22 |  | 27 | 26 | 2638 |  |  |  | 2496 |  |  |  |  |  |  | 2704 | 2757 |  |  | 29 |  |  |
| 23 |  |  |  |  | 09 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 23 |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
| 25 | 7665 | 7625 |  |  | 7503 |  | 7422 | 7381 | 7341 | 20.7300 | 13.9195 | 9255 | 931 | 9376 | 9436 | 497 | 557 |  |  |  | 25 |
| 26 | 5972 | 59 | 5888 | 5845 | 5803 | 5761 | 5719 | 5677 | 5634 | 21.5592 | 14.4 | 48 | 4888 | 4951 | 5014 | 5076 |  | 52 |  |  |  |
| 27 |  |  |  |  |  |  |  |  |  | 22．3884 |  |  |  |  |  |  |  |  |  |  | 27 |
| 28 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 28 |
| 29 | 0892 | 0845 |  |  |  |  |  |  | 0515 |  |  |  |  |  | 1746 |  |  |  |  |  | 29 |
| －30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $\frac{30}{31}$ |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 32 <br> 33 |
| 33 <br> 34 | 4248 | 43 | 23 | 225 | 2204 | $\begin{aligned} & 385 \\ & 214 \end{aligned}$ | 203 | 203 | 1983 | 28．19 | 18.9305 | ${ }^{3387}$ | $\begin{array}{\|c} 3896 \\ 9469 \end{array}$ | 9551 | 9633 | $\left\lvert\, \begin{aligned} & 413 \\ & 971 \end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & 421 \\ & 979 \end{aligned}\right.$ | $\left.\right\|_{988} ^{425}$ |  | ${ }^{4} 84$ | 33 <br> 34 |
| 35 | 073 | 067 | 06 | 0561 | 05 |  |  | 0334 | 0277 | 29.02 |  | 4957 | 5042 | 5126 | 5211 | 5295 | 5380 | 5464 | 5549 |  | 35 |
| 36 | 9038 | 8980 | 8921 | 8863 | 8804 | 8746 | 8688 | 8629 | 8571 | 29：8512 | 20.0440 | 0527 | 0614 | 0701 | 0788 | 0875 | 0962 | 1049 |  |  | $\frac{36}{}$ |
| 37 |  | 72 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 37 |
| 38 | 56 | 559 | 5528 | 546 | 54 | 5343 | 5281 | 5220 | 51 |  |  | 1668 |  | 185 | 1943 | 2035 | 21 | 22 |  |  | 38 |
| 39 |  |  |  |  |  | 3642 | 357 | 3515 | 3451 | 32．3388 | 21.7144 | 72 | 73 | 742 | 75 |  |  |  |  |  | 39 |
| 40 | 226 |  |  |  | 2005 | 1940 | 187 | 1810 | 1745 | 680 | 22．2712 | 2808 | 2905 | 300 | 30 | 3195 | 3291 | 3388 | 3484 |  | 40 |
| 41 | 0571 | 0504 | 0438 | $0^{0372}$ | 0305 | 0239 | －182 | 0105 | －039 | 33．9972 | 22 28.8279 | ${ }^{8378}$ | 8477 | 8576 | 8675 | 8774 | ${ }^{8873}$ | 85 | 90 |  |  |
| 42 |  |  | 8741 | 867 | 86 | 8537 | 846 | 84 | 8332 | 34－8264 | $23 \cdot 3847$ | 39 | 4050 | 4152 | 4253 | 4354 | 4456 | 45 |  |  | 42 |
| 43 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 43 |
| 44 |  | 54 |  |  |  |  |  |  |  |  |  |  |  |  |  | 551 |  |  |  |  |  |
| 45 |  | 37 | 3651 | 3579 | 3506 | 3433 | 3359 | 3286 | 3213 | 37.3140 | 25.0551 |  |  | 0877 | 0985 | 1094 | 1203 | 1311 | 1420 | 1528 | 45 |
| 46 | 210 | 2029 |  |  |  | 17 |  | 1582 |  | 38／143 | 25.611 |  |  |  | 6563 | 6674 |  |  |  |  | 46 |
| 47 | 041 | 0334 | 0258 | 0182 | 0106 | 1030 | 9953 |  | 9801 | 38 | 26．1686 | 1800 |  |  |  | 2254 | 2367 |  | 259 |  | 47 |
| 48 |  |  |  | 8484 |  |  | 8250 | 8172 | 8094 |  |  |  |  |  |  |  |  |  |  |  | 48 |
| 49 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 49 |
| 50 | 533 | 5249 | 5168 |  |  | 492 |  | 4763 | 46 |  |  |  |  | 875 | 8873 | 899 |  | 23 | 93 |  | 5 |
| 51 | 3637 | 3554 | 3472 | 3389 | 33 | 3224 | 314 | 3058 | 2975 | 42．2892 | 28＇3957 | 4081 | 4204 |  | 445 | 457 | 469 |  |  |  |  |
|  |  |  |  |  | 16 |  | 1438 | 1353 | 1269 | $43 \cdot 1184$ | 28.9525 | 9651 | 97 |  | P02 | 0153 | 027 |  |  |  | 52 |
| 53 | 025 | 016 | 4078 |  | 9907 | 9821 | 9734 | 9648 | 562 | 4 |  | 522 | 536 |  | 5605 | 573 |  |  | 61 | 62 | 53 |
| 54 |  |  |  | 82 | 82 | 81 | 8031 | 79 | 7856 |  |  |  | 09 | 105 | 118 | 1313 | 144 | 15 |  |  | 54 |
| 55 |  | 67 |  | 65 | 6507 | 6418 | 6328 | 6239 | 6150 | $45^{6} 6060$ | $30 \cdot 6$ | 63 |  |  |  |  | 702 | 7158 | 729 |  | 55 |
| 56 | 5170 | 5079 | 4988 | 4898 | 4807 | 4716 | 4625 | 4534 | 4443 | 46.4352 | 31.1796 | 1932 | 2067 | 12202 | 2337 | 2472 | 2608 | 274 | 287 | 30 |  |
| 57 |  | 338 | 32 | 319 |  | 30 | 2922 | 2829 | 2737 | 47－2644 | 31.7364 | 7 |  |  | 7915 | 8052 | 8190 | 研 | － |  |  |
| 58 |  |  |  | 1501 | 1407 | 1313 | 1219 | 1125 | 1030 | $48^{\circ} 0936$ | 32．2932 | 307 | 321 | 335 | 3492 | 363 | 37 | 39 | 40 |  | 58 |
| 59 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 59 |
| 60 | 8396 | 8299 | 8202 | 8105 | 8007 | 7910 | 7813 | 7715 | 7618 | 49 | 33.4 | 4212 | 4357 | 45 | 4647 | 4792 | 4937 | 5082 | 5226 | 5371 |  |
| 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 61 |
|  |  | 490 | 48 |  |  |  | 44 | 43 |  |  |  |  |  |  |  |  |  |  | 64 |  |  |
| 63 | 331 | 3214 | 3112 | 3010 | 29 | 2806 | 270 | 2601 | 2499 | 52．2396 | 35.0771 | 0923 | 1075 | 122 | 1379 | 1531 | 168 | 183 |  |  | 63 |
| 64 |  | 15 | 1415 | 13 |  | 11 | 10 | 08 | 0792 | 53．0688 | 35.63 | 64 | 66 |  |  | ， |  |  | 75 |  | 64 |
| 65 |  |  |  | 9613 | 950 | 940 | ， |  | 9086 | 3980 | 1906 | 2063 | 2220 | 2377 | 2534 | 2691 | 2848 |  | 31 |  | 65 |
| 66 | 8236 | 81 | 802 | 7915 | \％ | 770 | 7594 | 7487 | 7379 | 547272 | 36．7474 | 7634 | 77 | 7952 | 8112 | 8271 | 843 | 859 |  |  |  |
| 67 |  |  | 632 | 62 | 61 | 60 | 589 | 5782 | 5673 | 55.5564 | 37．3042 | 32 | 33 | 3527 |  | 3851 | 4013 | 417 | 4336 |  |  |
| 68 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 68 |
| 69 | 3156 | 304 | 2932 | 2820 |  |  |  |  | 2260 |  |  |  |  |  | 4844 | 5011 | 5177 |  |  |  | 69 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 05917 |  | 6513 |  |  |  |
| 72 | 807 | 795 | 78 | 7726 | 76 | 749 | 737 | 7258 | 714 | 59．7024 |  | 105 |  | ， | 1576 | 1750 | 1924 |  |  |  | 72 |
| 73 | 6382 |  |  |  |  | $579$ | 5672 | 5553 | 543 | 60.53 | 40 | 66 | 68 |  | 7154 | 7330 | 7506 | 768 | 785 |  | 73 |
| 74 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 74 |
| 75 | ） 2996 | 2874 | 2752 | 2631 |  |  | 2266 | 2144 | 2022 |  |  | 76. | 94， |  | 8309 |  | 8671 | 88. |  |  | 75 |
| 76 | 1302 | 1179 | 1056 | 09 | 08 | 06 | 05 | 0439 | 03 | 63．01 | 42.315 | 333 | 3519 | ${ }^{3703}$ | 38 | 4070 | 硅 | 44 |  |  |  |
| 77 |  |  |  | 92 | 9109 | 89 | 88 | 8734 | 86 | 63：8484 | 42.87 | 89 |  |  | 94 | 9650 | 9 | 10 | 020 |  | 77 |
| 78 |  |  |  |  |  |  | 7156 |  |  |  |  |  |  |  |  | 5229 | 541 |  |  |  | 78 |
| 98 | 622 |  |  |  |  |  |  | 5325 |  |  |  |  |  |  |  |  |  |  | 506 |  | 㖪 |
| 80 | 452 | 4399 |  | 4140 | 401 |  | 3750 | 3620 | 3490 | 6 | 4 | 5616 | 0 | 6003 | 6196 | 6389 | 6582 | 6775 | 696 | 716 | 80 |
| 81 | 2835 | 2704 |  | 244 | 2310 | 2179 | 2047 | 1915 | 1784 | 671652 | $45^{\circ} 09$ | 118 | 1382 | 1578 | 1774 | 1969 | 2165 | 236 | 25 |  |  |
| 82 | 114 | 10 | 087 | 07 | 0610 | 047 | 0344 | 0211 | ＋077 | 67．99 | 45.6559 | 6757 | 6955 | 7153 | 7351 | 7549 | 774 | 794 | 81 |  |  |
| 83 | 19448 | 93 | 917 |  | 8910 | 87 | 8641 | 850 | 8371 | 68.8 | 46.212 | 23 | 2528 | 27 | 292 | 3129 | 3329 | 352 | 373 |  | 83 |
| 84 |  |  |  |  |  |  | 693 | 509 |  |  |  |  |  |  | 850 |  |  |  |  |  | 84 |
| 85 | 6062 | 5924 | 5786 | 56 | 5510 | 5373 | 5235 | 509 | 495 | 70．482 | 47.32 | 3468 | 367 | 387 | 4083 | 42 | 448 | 4699 | 490 |  |  |
| 86 | 436 | 42 | 析 | 3950 | 3811 | ${ }^{367}$ | 3531 | 3392 | 325 | 71.3112 | 47.883 | 9038 | 9245 | 9453 | 563 | 9868 | ＋076 | 028 |  |  |  |
| 87 |  | 25 |  | 225 | 2111 | 1970 | 1828 | 1687 | 1546 | 72．142 | 48.43 | 460 | 4818 |  | 5238 | 5448 | 5658 | 586 |  |  | 87 |
| 89 |  |  |  |  |  | ${ }_{8567}^{0268}$ | $\stackrel{1}{84}$ | 8277 | 8133 | 72.9696 73.7988 | 49 | 1178 | 039 596 | 0603 6178 | 0816 | 1028 | 1241 | 1453 | 166 | 187 |  |
| 90 | 7595 | 7449 | 7303 | 7157 | 701 | 6865 | 6719 | 82773 | 18487 | 74：6280 | 49.533 50.1101 | 31 | 1536 | 1753 | 197 | 218 | 240 | 2622 | 2839 | 305 | ${ }^{89}$ |
|  | 590 | 57 |  | 5459 |  | 15164 | 5016 | 4868 | 4720 | 75．45 | 50.66 | 688 | 7109 | ${ }^{7328}$ | 754 | 776 | 798 | 820 | 84 |  |  |
| 92 | 420 | 40 | 3910 | 3761 | 3611 | 3462 | 3313 | 3163 | 301 | 76．2864 | 51.223 | 24 | 26 | 2903 | 3125 | 3348 | 3570 | 379 | 401 |  | 92 |
|  | 2514 |  |  |  |  |  |  | 1458 |  |  |  |  | 825 | 84 |  |  | 915 |  |  |  |  |
| 94 | 9128 | 8974 | 8820 | 8666 | 2212 | 8358 | 8203 | ${ }^{9754} 8$ | 7895 | 78 | 52＇337 | 9170 | 9399 | 96 | 9858 | －087 | 4734 0317 | 0546 |  |  |  |
| 96 | 7434 | 7279 | 7123 | 6968 |  | 6656 | 6500 |  |  | $79 \cdot 6032$ |  |  |  |  |  | 5667 |  |  |  |  |  |
|  | 574 | 5584 | 5427 | 5269 | 5112 | 4955 | 4797 | 4639 | 4482 | 80．4324 | 54－0076 | 0310 | 0544 | 0778 | 1013 | 124 | 1481 | 171 | 10 |  | 97 |
|  |  |  |  | 3571 |  | 3253 | 3094 |  |  | 81.2616 |  |  | 6117 | 6354 |  |  | 7063 |  |  |  |  |
|  |  |  |  |  |  | ${ }^{1552}$ |  |  | 363 | 2．9200 | 55.121 | 450 | 689 |  | 2168 |  | 2646 | 2885 | 317 | 3362 | 99 |
|  | 0661 | 499 |  |  |  |  |  |  |  | $2 \cdot 9200$ | 55.6779 | 221 |  |  | 7745 |  | 8228 | 3469 | 8711 | 3952 |  |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | ${ }^{\prime}$ | $5^{\prime}$ | ＋ | $\bigcirc$ | $2^{\prime}$ | 1 | 10 | 9 | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | 5 | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ | 1 |  |
| 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Sint |  |  |  |  |  |

TRAVERSE TABLES．

\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{\(34^{\circ}\)} \& \multicolumn{6}{|l|}{Cosine．} \& \multicolumn{9}{|r|}{Sine． 3} \& \multicolumn{2}{|r|}{\(34^{\circ}\)} \\
\hline \& \(0^{\prime}\) \& \(1^{\prime}\) \& \(2^{\prime}\) \& \(3^{\prime}\) \& \({ }^{1}\) \& \(5^{\prime}\) \& \(6^{\prime}\) \& \& \(8^{\prime}\) \& \& \& \& \& \(3^{\prime}\) \& － \& \(5^{\prime}\) \& \(6^{\prime}\) \& 7 \& \(8^{\prime}\) \& \({ }^{\prime}\) \& \\
\hline \& 329 \& \({ }^{8289}\) \& 8287 \& 8285 \& 8284 \& 8282 \& 8281 \& 327 \& \({ }^{327}\) \& 82 \& 5592 \& 5594 \& 5597 \& 5599 \& 5602 \& 5604 \& 5606 \& 5609 \& 5611 \& 5614 \& \\
\hline \& 6581 \& 6577 \& 6574 \& 6571 \& 6568 \& 65 \& 6561 \& \& \& \& 11184 \& 118 \& 1194 \& 1198 \& \& \& 1213 \& 1218 \& 1222 \& 12：2 \& \\
\hline \& 87 \& 4866 \& 4861 \& 56 \& 4855 \& 4847 \& 48 \& 4837 \& 4832 \& \({ }^{2} 4.482\) \& ． 6776 \& 6783 \& 6790 \& 6797 \& 6805 \& 6812 \& 19 \& 6826 \& 6834 \& \& \\
\hline \& 16 \& 3155 \& 3148 \& 3142 \& 3135 \& 3129 \& 312 \& 31 \& \& 3．31 \& 2．2368 \& 2377 \& 2387 \& \({ }_{7}^{2397}\) \& 06 \& 2416 \& 2426 \& 2435 \& \& \& \\
\hline 5 \& 1452 \& 1444 \& 1436 \& 1427 \& 1419 \& 1411 \& 14 \& 135 \& 1387 \& 4.13 \& \& 797 \& 7984 \& 7996 \& 8008 \& 8020 \& 8032 \& \& \& \& \\
\hline 6 \& 9742 \& ｜9732 \& 19723 \& 9713 \& 9703 \& 9693 \& 9684 \& 9674 \& 9664 \& 4.96 \& 3．3552 \& 3566 \& 3581 \& 3595 \& 3609 \& 3624 \& 3638 \& \({ }^{3653}\) \& ｜3667 \& 3682 \& \\
\hline \& 8033 \& 8021 \& 8010 \& \& 7987 \& 7976 \& \& 7953 \& 794 \& \(5 \cdot 7\) \& ． 9144 \& 9160 \& 9177 \& 9194 \& 9211 \& 9228 \& 9245 \& 9262 \& 9278 \& \& \\
\hline \& 632 \& 6310 \& 6297 \& 6284 \& 6271 \& 6258 \& 6245 \& 6232 \& 6219 \& 6．620 \& 4.4735 \& 4755 \& 4774 \& 4793 \& 4813 \& 4832 \& 4851 \& 487 \& 4890 \& \& \\
\hline \& 4613 \& 4599 \& 15 \& 4569 \& 4555 \& 4540 \& 45 \& 4511 \& 44 \& 7.4481 \& 5.0327 \& 0349 \& 0371 \& 0392 \& 0414 \& 0436 \& 0458 \& 04 \& 0501 \& \& \\
\hline 10 \& 2904 \& 2887 \& 2871 \& 2855 \& 2839 \& 2822 \& 2806 \& 279 \& 2773 \& 8.2757 \& 5.5919 \& 5943 \& 5968 \& 5992 \& 6016 \& 602 \& 6064 \& 6088 \& 6112 \& 6136 \& \\
\hline 11 \& 119 \& 176 \& 158 \& 120 \& 1123 \& 110 \& 103 \& 1069 \& 1051 \& 9.103 \& 6.1511 \& \({ }_{7} 1538\) \& 56 \& 159 \& 1617 \& \& 1670 \& \& \& \& \\
\hline 12 \& 9485 \& 9465 \& 9445 \& 9426 \& 940 \& 938 \& 9367 \& 93 \& 9328 \& 9.930 \& \(6 \cdot 7103\) \& 7132 \& 7161 \& 719 \& 7219 \& \& \& \& \& \& 2 \\
\hline 13 \& \& 77 \& 7733 \& 7711 \& \& 76 \& 76 \& 7627 \& 7605 \& 10. \& 7 \& 2726 \& 2758 \& 278 \& \& \& \& \& 2946 \& 2977 \& 13 \\
\hline 15 \& 6065 \& 60 \& \& \& \& \& \& \& \& \& \& \& \& 838 \& 842 \& － \& 8489 \& 8523 \& 8557 \& 859 \& 14 \\
\hline 15 \& 43 \& 4331 \& 4307 \& 4282 \& 4258 \& 42 \& 4209 \& 4185 \& 4160 \& 12.4 \& \(8 \cdot 3\) \& 3915 \& 395 \& 3987 \& 4024 \& 4060 \& 4096 \& 2 \& 8 \& \& 5 \\
\hline 16 \& 264 \& 262 \& 2594 \& 2568 \& 2542 \& 2516 \& 2490 \& 2464 \& 2437 \& 13 \& 8.9471 \& \& 9548 \& \& 962 \& 966 \& 970 \& 974 \& 19779 \& 9818 \& 6 \\
\hline 17 \& \& \& \& 53 \& \& \& \& \& \& \& \& \& \& \& \& \& 530 \& 535 \& 5391 \& 543 \& 7 \\
\hline 18 \& 72 \& 9197 \& 9168 \& 39 \& 9110 \& 9080 \& 9051 \& 9021 \& 8992 \& 14：8963 \& 10.0655 \& 0698 \& 0742 \& 0785 \& 0828 \& 0872 \& 0915 \& \& 1002 \& \& 18 \\
\hline 19 \& 751 \& 7486 \& \& \& 7393 \& 7362 \& 7331 \& 7300 \& 726 \& 15.7238 \& \(10 \cdot 6247\) \& \({ }^{6292}\) \& 6338 \& 6384 \& 6430 \& 6476 \& 6521 \& 6567 \& 6613 \& \& 9 \\
\hline 20 \& 58 \& 575 \& 5742 \& 571 \& 5677 \& 5045 \& 5612 \& 5579 \& 5547 \& 16.5514 \& 11.1839 \& 1887 \& 1935 \& 1983 \& 2031 \& 208 \& 212 \& 2176 \& 2224 \& \& \\
\hline 21 \& 4098 \& 4064 \& 4030 \& 3995 \& 3961 \& 3927 \& 3893 \& 3858 \& 3824 \& 17.379 \& 11.7431 \& 7481 \& 7532 \& 758 \& 76 \& 768 \& 773 \& \& \& \& \\
\hline 22 \& 23 \& 2352 \& 2317 \& 2281 \& 2245 \& 2209 \& 2173 \& 2137 \& 2101 \& 18.2066 \& 12.302 \& 3075 \& 31 \& 31 \& 32 \& \& \& 4 \& \& \& \\
\hline 23 \& 0679 \& O6 \& 0604 \& 0566 \& 05 \& 0 \& 0454 \& 04 \& 0379 \& 19.0341 \& 12.86 \& 8670 \& 87 \& 87 \& 88 \& \& \& \& \& \& 23 \\
\hline 24 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& 24 \\
\hline 25 \& 7259 \& 72 \& 7178 \& \& \& 70 \& \& 69 \& 693 \& \(20 \cdot 6\) \& \(13 \cdot 9\) \& \& \& \& \& \& \& \& \& \& \\
\hline 26 \& 5550 \& 5507 \& 5465 \& 5423 \& 5380 \& 5338 \& 5296 \& 5253 \& 5211 \& 21 \& 14 \& 5453 \& 5516 \& 5578 \& 56 \& 5704 \& \& 15829 \& 15891 \& \& 6 \\
\hline 27 \& 3840 \& 3796 \& 3752 \& \& \& \& \& \& 3488 \& \& \& \& \& \& \& \& \& 143 \& \& \& \\
\hline 28 \& \({ }^{2131}\) \& 20 \& 20 \& 1994 \& 1948 \& 190 \& 1857 \& 1811 \& 17 \& \(23^{\prime}\) \& \(15^{\circ} 65\) \& 6642 \& 670 \& 6777 \& \& 6911 \& 6979 \& 6 \& \& \& 28 \\
\hline 29 \& 042 \& 0374 \& 0327 \& \& \& 0185 \& 0137 \& 0090 \& 1043 \& 23 \& \(16 \cdot 2166\) \& 2236 \& 23 \& 2376 \& \& 2515 \& 2585 \& \& \& \& 29 \\
\hline 30 \& 87 \& 8662 \& 8614 \& 8565 \& 8516 \& 8467 \& 8418 \& 8369 \& 8320 \& 24•8271 \& \(1{ }^{16 \cdot 7758}\) \& 783 \& 7903 \& 7975 \& 80 \& 811 \& 819 \& 4 \& 833 \& \& 0 \\
\hline 31 \& 7002 \& \({ }^{6951}\) \& 6901 \& 6850 \& 6800 \& 674 \& 669 \& 6648 \& 6598 \& \(25^{2} 6547\) \& 17.3350 \& 3425 \& 349 \& 3577 \& 36 \& \& \& \& 394 \& \& 1 \\
\hline \& 52 \& 52 \& 5188 \& \& 88 \& 5031 \& 4979 \& 493 \& 4875 \& \(26^{\prime} 4823\) \& 1788 \& 9019 \& \& 91 \& 92 \& \& \& \& \& \& \\
\hline 33 \& 35 \& 35 \& 347 \& 3421 \& 3368 \& 3314 \& 3260 \& 3206 \& 3152 \& \(27 \cdot 30\) \& 18．4534 \& 4613 \& 469 \& 4772 \& 485 \& \& \& \& 517 \& \& 3 \\
\hline \& \& 18 \& \& \& \& \& 1541 \& 1485 \& 143 \& \& \& \& \& 03 \& \& 05 \& \& \& \& \& 34 \\
\hline 35 \& 016 \& 0106 \& 10 \& 99 \& 9935 \& 9878 \& 9821 \& 9764 \& 9707 \& 28.96 \& 19 \& \& 588 \& 597 \& 60 \& 6139 \& 6224 \& \& \& \& 35 \\
\hline 36 \& 845 \& \& 83 \& 827 \& 8219 \& 8160 \& 8102 \& \& 7984 \& 29.792 \& 20 \& 139 \& 14 \& \& \& \& \& \& \& \& \\
\hline \& \& 66 \& \& 656 \& 6503 \& 6443 \& 63 \& 63 \& 626 \& 30．62 \& \& 699 \& \& \& 725 \& \& \& \& \& 7704 \& 37 \\
\hline 38 \& 50 \& 49 \& \& \& 4787 \& \& \& \& \& \& \& 210 \& \& \& \& \& 3043 \& 3134 \& \& 331 \& 38 \\
\hline 39 \& 33 \& \& \& \& \& \& \& \& \& \& \& \& 8273 \& \& \& 8555 \& \& \& \& \& 析 \\
\hline 40 \& 1615 \& 1550 \& 1485 \& 1420 \& 1355 \& 1289 \& 1224 \& 1159 \& 094 \& 33．102 \& 22：3677 \& 3774 \& 387 \& 396 \& 406 \& 415 \& 425 \& 435 \& 44 \& 4545 \& 0 \\
\hline 41 \& 990 \& 9839 \& 19772 \& T907 \& 9638 \& 9572 \& 9505 \& 9438 \& 9371 \& 33＇93 \& \(22 \cdot 92\) \& 9368 \& 946 \& \& 966 \& 97 \& \& \& \& \& 1 \\
\hline \& 81 \& 81 \& 80 \& \& \& \& 77 \& 77 \& 7648 \& 34.7580 \& 23＇4861 \& 4962 \& 50 \& 51 \& \& \& 5468 \& \& \& \& 2 \\
\hline 43 \& 64 \& 64 \& 6346 \& \& 6206 \& 6136 \& \& 59 \& 52 \& 35．5855 \& 24 \& 0557 \& \& 07 \& \& \& \& \& 1282 \& \& 43 \\
\hline \& 477 \& \& 46 \& 4562 \& 4490 \& 4418 \& 4347 \& 42 \& 4203 \& 36．4131 \& \& 6151 \& 625 \& 63 \& 64 \& 65 \& \& 6787 \& \& \& 44 \\
\hline 45 \& 306 \& 2994 \& 29 \& 28 \& 2774 \& 2701 \& 2627 \& 2554 \& \& 37－2407 \& \(25^{\circ}\) \& 17 \& 185 \& 196 \& 207 \& 217 \& 2288 \& 2396 \& 2504 \& \& 45 \\
\hline \& \& \& 1208 \& 1133 \& 10 \& 0983 \& 0908 \& 08 \& 0758 \& 38．068 \& 25 \& 734 \& \& \& \& \& \& \& \& \& \\
\hline 47 \& 96 \& 9571 \& 9495 \& \& \& \& \& \& 9035 \& 38.89 \& \& \& \& \& 327 \& \& \& \& \& \& 7 \\
\hline 48 \& 793 \& 78 \& \& \& 7625 \& 5 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& 8 \\
\hline \[
\begin{gathered}
49 \\
50
\end{gathered}
\] \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& 50 \\
\hline 51 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \\
\hline 52 \& 110 \& 101 \& 093 \& 0846 \& 0761 \& 067 \& 05 \& 05 \& 0422 \& 43 \& \& 090 \& 103 \& 115 \& 128 \& 14 \& 153 \& 165 \& 1783 \& \& 2 \\
\hline 5 \& 930 \& 9304 \& 92 \& \& 9045 \& 8958 \& 18872 \& 8786 \& 8699 \& 43．86 \& 29.6372 \& 650 \& 66 \& 675 \& 688 \& 位 \& \& 7266 \& 739 \& \& 5 \\
\hline 54 \& 7680 \& \& \& \& \& 72 \& 7153 \& 7064 \& 6976 \& \(44^{6} 68\) \& 30－1964 \& 209 \& 22 \& 2355 \& 24 \& 261 \& 2745 \& \& \& \& 5 \\
\hline 55 \& 5971 \& 5881 \& 5792 \& 5702 \& 5613 \& 55 \& 5433 \& 5343 \& 5254 \& 45－5164 \& 30.7556 \& 768 \& 7821 \& 7954 \& 808 \& 821 \& 835 \& 84 \& 86 \& 8749 \& 55 \\
\hline \& 4261 \& 4170 \& \({ }^{4079}\) \& \({ }^{3988}\) \& 389 \& \({ }^{380}\) \& 371 \& \({ }^{3622}\) \& \({ }^{353}\) \& 46．344 \& 31．31 \& \({ }^{328}\) \& 341 \& 355 \& 36 \& 38 \& \& 409 \& 42 \& \& 56 \\
\hline \& 25 \& \& \& 227 \& \& 2 \& 1994 \& 1901 \& \& \& \& 88 \& 90 \& 915 \& \& \& \& \& \& \& 析 \\
\hline \& 08 \& 1 \& \& \& \& 03 \& 0275 \& 0180 \& \& 47 \& 32．4332 \& 447 \& 46 \& 47 \& 48 \& \& \& 5310 \& \& \& 58 \\
\hline 60 \& 91 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& 50 \\
\hline \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& 1 \\
\hline \& 40 \& \& \& 37 \& 36 \& 34 \& \& \& 31 \& \& \& 68 \& \& 71 \& \& \& \& \& \& \& 2 \\
\hline 63 \& 2294 \& 2191 \& 208 \& 19 \& 1883 \& 17 \& 1678 \& 1575 \& 1472 \& 52．137 \& \(35^{\circ} 22\) \& 244 \& 259 \& 274 \& 289 \& 305 \& 320 \& 335 \& 35 \& \& 3 \\
\hline 64 \& 058 \& \& \& \& \& －0 \& \& 9854 \& \& 52：9645 \& 35.7883 \& 8038 \& 8192 \& 8346 \& 8501 \& 8655 \& 8809 \& \& \& \& 64 \\
\hline 65 \& 8874 \& 8769 \& 8663 \& 8557 \& 8451 \& 8345 \& 8239 \& 8133 \& 8027 \& 53．7921 \& \(36^{3} 3475\) \& 3632 \& 3789 \& 3946 \& 4102 \& 4259 \& 4415 \& 4572 \& 47 \& \& 5 \\
\hline 66 \& 7165 \& 7057 \& 6950 \& 6843 \& 6735 \& 6627 \& 6520 \& 6412 \& 6304 \& 54．6197 \& \(36 \cdot 906\) \& \({ }^{9226}\) \& 93 \& 954 \& 9704 \& 9863 \& ＋02 \& 018 \& 034 \& 04 \& 66 \\
\hline \& 54 \& 53 \& 523 \& 51 \& 5019 \& 49 \& 480 \& 461 \& 4582 \& 55＇447 \& \(37 \cdot 46\) \& 4821 \& 4982 \& 5144 \& 53 \& 5467 \& \& 5789 \& \& \& 67 \\
\hline 68 \& 3746 \& 36 \& 352 \& 3414 \& \& 31 \& 3081 \& 12910 \& 2859 \& 56．27 \& \(38^{\circ} 02\) \& 041 \& 05 \& 0743 \& ¢5 \& 107 \& 1235 \& 1398 \& 1562 \& \& 68 \\
\hline 69 \& 2036 \& 1924 \& 1811 \& \& 1587 \& 1474 \& \& 120 \& 13 \& \& \(38 \cdot 5\) \& \& 6176 \& 63 \& 65 \& 667 \& \& \& \& \& 69 \\
\hline 70 \& 03 \& 10212 \& 0988 \& 998 \& 870 \& 9756 \& 9642 \& 9528 \& 9414 \& 57．930 \& 39.14 \& 1604 \& 1773 \& 19 \& 211 \& 227 \& 244 \& 261 \& 2784 \& \& 70 \\
\hline 71 \& 86 \& 8501 \& \& 827 \& 8754 \& 8039 \& 7923 \& 硅 \& 7691 \& \& \& \& \& \& \& \& \& \& \({ }^{8396}\) \& \& 71 \\
\hline \& \& 679 \& 6673 \& 655 \& 6438 \& 632 \& 6203 \& 608 \& 596 \& 59．58 \& 40.26 \& 2792 \& 296 \& 31 \& 3313 \& 迷 \& 36 \& 3833 \& 400 \& \& 2 \\
\hline 74 \& 5197 \& 507 \& 206 \& 48 \& 47 \& 46 \& 44 \& 436 \& 42 \& 60 \& 40 \& 83 \& \& \& \& \& \& \& \& \&  \\
\hline 74
75
7 \& 3488
1778 \& \({ }_{16}^{336}\) \& 15 \& 14 \& \& 2885 \& \& 26 \& \& \(62^{20678}\) \& 41.3803
41.9395 \& \& 4160 \& \& \& \& \({ }^{4873}\) \& \& \& \begin{tabular}{|l}
5407 \\
1021
\end{tabular} \& \begin{tabular}{l}
74 \\
75 \\
\hline
\end{tabular} \\
\hline \& 1069 \& 994 \& \& 9697 \& 9574 \& 945 \& 9326 \& 9202 \& 9078 \& 62：8954 \& 42．49 \& ［170 \& 5353 \& 553 \& 5719 \& 5903 \& 608 \& 626 \& 645 \& 66 \& 76 \\
\hline 77 \& 8359 \& 8234 \& 8108 \& \& 7858 \& 7732 \& 7606 \& 7481 \& 73 \& － 15 \& 43 \& 2764 \& － \& 13 \& 1321 \& 171 \& 182 \& 1877 \& 2063 \& \& 7 \\
\hline 78 \& 6649 \& 6522 \& 6395 \& 6268 \& 6141 \& 601 \& 1889 \& 5760 \& 5633 \& 64：5505 \& 43.1770 \& 6359 \& 6547 \& 673 \& 6923 \& 711 \& 7298 \& 6 \& \& \& 8 \\
\hline 79
80
80 \& 49 \& \& \& \& \& \& \({ }_{244}^{416}\) \& 403 \& 21 \& \(65 \cdot 3781\)
66.2057 \& 44.1762
44
4 \& \& \({ }_{77}^{21}\) \& \& \({ }_{812}^{252}\) \& 33 \& 2905 \& 95 \& 35 \& \& 79 \\
\hline 80 \& 323 \& \& \& \& \& 257 \& \& \& \& \& 44.7354 \& \& \& \& \& 8318 \& 8511 \& 04 \& \& \& 30 \\
\hline \& 1581 \& 1389 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \\
\hline \& 8101 \& \({ }_{79}^{968}\) \& 19544 \& 94 \& 9277 \& 19143 \& 90 \& \({ }^{8876}\) \& 8742 \& 68： 68884 \& 45.8538
46.4130 \& \({ }_{43}^{87}\) \& 8934
450
4

4 \& 913 \& ${ }^{9329} 4$ \& \[
\left.\right|_{E120} ^{9526}

\] \& \[

\left|$$
\begin{array}{c}
9724 \\
5020
\end{array}
$$\right|
\] \& 9921

553 \& | +119 |
| :--- |
| 5730 | \& \& ${ }_{8}^{82}$ <br>

\hline 83 84 \& 8101 \& 7255 \& 6118 \& 59 \& 584 \& 74 \& 557 \& 543 \& \& \& \& \& 45 \& \& 4 \& 0734 \& 533 \& 53 \& \& \& 88 <br>
\hline 85 \& 4682 \& 45 \& \& 42 \& 4128 \& 3990 \& 3851 \& 37 \& 3574 \& 70．3435 \& 47.53 \& 551 \& 572 \& 59 \& ¢ \& 63 \& 654 \& \& \& \& ${ }_{85}^{84}$ <br>
\hline \& 2972 \& 2832 \& 2692 \& 25 \& 2412 \& 2272 \& 2132 \& 1992 \& 1851 \& 711711 \& $48^{\circ}$ \& 1113 \& 1321 \& 15 \& 1735 \& 1942 \& 2150 \& 2357 \& 256 \& \& ${ }^{36}$ <br>
\hline \& 1263 \& 1121 \& 0980 \& Os \& 0 \& O5 \& 0412 \& 0271 \& ， \& 位 \& 48 \& 670 \& \& \& \& \& \& 7965 \& －18 \& \& <br>
\hline 89 \& \& 94 \& \& ${ }_{7409}^{9123}$ \& ${ }_{7264} 898$ \& 17837 \& 8693 \& 8550 \& \& \& \& \& \& ${ }_{83}^{272}$ \& ${ }_{8540}^{2938}$ \& 3150
8754 \& （3362 \& ${ }_{3}$ \& 7 \& \& ${ }_{88}^{88}$ <br>
\hline 90 \& 134 \& 5987 \& 5841 \& 5694 \& 5548 \& 5401 \& 5254 \& 5107 \& 4961 \& ${ }_{74.4814}$ \& 50．3274 \& 349 \& 3708 \& 3925 \& 4141 \& 4358 \& 4575 \& 4792 \& 5009 \& 5225 \& <br>
\hline \& 4424 \& ${ }^{4276}$ \& 4128 \& ${ }^{3980}$ \& ${ }^{3832}$ \& 368 \& 3535 \& 3386 \& ${ }^{3238}$ \& $75 \cdot 30$ \& 50 \& 90 \& 9304 \& 9524 \& 97 \& \& ${ }^{18}$ \& \& \& \& <br>
\hline \& 2715 \& 2565 \& 2415 \& 2265 \& 2115 \& 1966 \& 189 \& 1665 \& 1515 \& 76．1365 \& 51.4457 \& 4679 \& 49 \& 5123 \& 5345 \& 5566 \& 5788 \& \& 623 \& \& <br>
\hline \& \& 0854 \& 07 \& 055 \& 0399 \& 0248 \& ${ }^{*} 097$ \& ${ }^{994} 4$ \& 9793 \& 76．9641 \& 52．0049 \& 0274 \& 049 \& 072 \& ¢ \& 1170 \& 矿 \& 161 \& 184 \& \& 93 <br>
\hline 94 \& 矿 \& \& \& \& 8683 \& 8530
6812 \& 8377 \& 8223

6502 \& | 8070 |
| :--- |
| 634 | \& 7717917

$78 \cdot 6192$ \& $52 \cdot 5641$
53.123 \& \& ${ }_{169}^{609}$ \& 19321 \& 656 \& ${ }^{6774}$ \& 26 \& \& \& \& 94 <br>
\hline $\frac{95}{96}$ \& 7586 \& \& 7276 \& \& \& \& \& \& \& \& \& \& \& \& \& \& 26 \& \& \& \& <br>

\hline \& 5876 \& 572 \& 5564 \& 5407 \& | 5251 |
| :--- |
| 3535 | \& 5094 \& ${ }_{3218}^{4938}$ \& 4781 \& 4625 \& ${ }^{79} .44688$ \& \& \& \& 7520 \& \& \& 3 \& 8445 \& \& \& <br>

\hline \& 25 \& \& \& \& \& \& \& \& \& \& ${ }^{54.2417}$ \& \& \& \& 335 \& \& \& 40 \& \& \& ${ }_{98} 97$ <br>
\hline \& 245 \& ${ }^{2298}$ \& ${ }_{0425}^{2188}$ \& \& \& 993 \& 9780 \& \& \& \& \& \& \& 43 \& 455 \& 47 \& \& \& \& \& 98 <br>
\hline 100 \& 9038 \& 875 \& 712 \& 549 \& 8386 \& 8223 \& 8060 \& 7897 \& 7734 \& 82757 \& 55．9193 \& 9434 \& 9675 \& 9916 \& ＋157 \& 0398 \& 0639 \& 888 \& 1121 \& 1361 \& 析 <br>
\hline \& $60^{\circ}$ \& $59^{\prime}$ \& $58^{\prime}$ \& 571 \& $56^{\prime}$ \& $55^{\prime}$ \& 54 \& $53^{\prime}$ \& 52 \& 51＇ \& $60^{\circ}$ \& 159 \& $58^{\prime}$ \& 57 \& 56 \& $55^{\prime}$ \& 54＇ \& ｜ $53{ }^{\prime}$ \& 52 \& $51^{\prime}$ \& <br>
\hline \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline
\end{tabular}

TRAVERSE TABLES.

| Cosine. |  |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | $13^{3}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | ${ }_{\text {c }}^{82685}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 4788 | 478 |  | $1 \cdot$ |  |  |  |  |  | 91 |  |  |  |  |
|  |  |  |  |  | ${ }_{1338}^{3070}$ | 1329 |  | 1313 | ${ }^{304} 130$ |  | 2:28 | ${ }^{2092}$ |  | 2416 | 8128 |  | ${ }_{8152}^{2522}$ | 25364 | ${ }^{2547}$ |  |  |
|  | 4 | 9635 | 25 |  |  |  |  | 9576 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 7907 |  |  | 787 | 786 |  | 7838 | 782 |  | $3 \cdot 9$ | 9329 | ${ }^{3346}$ | 9363 |  | 9336 | 9413 | 9430 | 9447 |  |  |
|  |  | 4452 | 4437 | 6153 4423 | 468 | 4393 | (6114 | ${ }_{4364}^{6101}$ | ${ }_{434}^{6088}$ |  |  | ${ }_{4}^{4947}$ | ${ }_{\text {c }}^{4967}$ | ${ }_{0}^{4986}$ |  |  | 54. |  |  |  |  |
| 10 |  |  |  |  |  | 4335 |  |  |  |  |  |  |  | 069 |  |  |  |  |  |  |  |
| 11 | 015 | 029 | 09790 | 0 |  |  |  | -889 |  |  |  | ${ }^{1803}$ | 1829 |  |  | 7537 | 1935 |  |  |  |  |
| $\begin{aligned} & 12 \\ & 13 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 565 | 11.56 | 7.86 |  |  |  | 8759 | 8793 |  |  |  |  |  |
| 15 | 4171 | 4087 | 4062 |  | 4013 |  | 3964 | 3939 | 3915 |  | 8.42 | 427 | ${ }_{4313}$ | 434 | 13885 | 4421 | 1455 | 4493 | 4529 |  |  |
|  |  | ${ }^{2359}$ 231 | 0604 | ${ }^{23576}$ | ${ }_{\text {2548 }}^{2281}$ | ${ }_{052}^{2254}$ | ${ }_{0492}^{2228}$ | ${ }_{045}^{2202}$ | ${ }_{043}^{2178}$ |  |  | 9895 | 9933 | 星5972 | 退 0101 | ${ }^{0049}$ | ${ }^{0087}$ | ${ }_{5}^{0126}$ | $\begin{array}{\|c\|c\|} \hline 1640 \\ 1090 \end{array}$ |  |  |
| $\left\|\begin{array}{l\|l\|} 17 \\ 18 \end{array}\right\|$ | ${ }^{8933}$ |  | 8875 |  |  |  |  | ${ }_{8727}$ |  |  |  | 1132 | 11575 | 1218 | 56 | 1335 | ${ }_{1348}$ | 1391 | 1435 |  |  |
| 19818 |  | 7176 <br> 549 <br> 1 |  |  |  | ${ }_{531}$ | ${ }_{5285}^{7021}$ | ${ }_{5252}^{6990}$ | 6959 |  |  |  | ${ }_{2417}^{6796}$ | ${ }_{2455}^{684}$ |  |  | 6979 260 |  |  |  |  |
| 21 | 5 | 372 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | ${ }^{1850}$ |  | 0040 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 55 | ${ }_{853}$ | 8499 | 8460 | ${ }_{8421}$ |  | ${ }_{8342}$ |  |  |  |  | ${ }_{4842}^{924}$ | 4900 | ${ }_{4958}^{2334}$ | 153015 |  |  |  |  |  |  |
|  |  | 6811 |  |  |  |  |  | 6566 | 652 |  |  | 0461 | los21 | 10581 | 10641 | 10701 | 0761 | 082 |  |  |  |
| 26 27 | 3126 | 5083 | ${ }_{3312}^{5041}$ |  | ${ }_{32}^{49}$ | 3179 | 71 | ${ }_{4028}^{4828}$ | ${ }_{3047}^{4786}$ |  |  | 1698 | $\left\lvert\, \begin{aligned} & 1742 \\ & 1763\end{aligned}\right.$ | ${ }_{182}^{620}$ | ${ }_{1892}^{6267}$ | 1957 | 292 | ${ }_{2087}^{6545}$ | -172 |  |  |
| 28 28 2 | 1674 | ${ }^{3} 1658$ | 1583 |  | 32 | 31475 | ${ }^{3335} 13$ | 1353 | 3308 |  |  | 16 | ${ }_{7383}$ | ${ }_{7451}^{1727}$ | 17818 |  |  |  |  |  |  |
| 29 | $\frac{31}{31}$ |  | ${ }_{8124}^{983}$ |  | 9756 8026 | 7977 | ${ }_{7928}^{9664}$ | ${ }_{789}^{9616}$ | 7889 | 23:925 |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 6446 | 6395 | 6344 | 6294 | 6243 | 6192 | 6141 | 6090 |  |  | 170 | ${ }^{4246}$ | ${ }^{4320}$ | 4395 | ${ }^{4470}$ | 544 |  |  |  |  |
|  |  | 47 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 1207 |  |  |  |  |  |  |  |  |  | 1488 |  |  | 1354 |  |  |  |  |  |
| 35 |  | 953 | 9478 | 9421 |  | 1930 | 9249 | 9192 | 913 | $28: 9077$ | 19.6561 | 6645 | T32 | 1681 | 6898 |  | 706 | 7150 | 7234 |  |  |
| 366 3 | ( 6141 | 780 | 774 | 76 | 76 | $\begin{aligned} & 759 \\ & 59 \end{aligned}$ |  | $\begin{aligned} & 7451 \\ & 571 \end{aligned}$ |  | 29.733 |  |  |  |  | 2523 | 10 | 2696 | 2783 |  |  |  |
|  |  |  |  |  | 4896 |  | 88 | 5717 | 565 |  |  |  |  |  |  | 238 |  |  |  |  |  |
| 394040 | 0963 |  |  |  | 2434 |  |  |  | 217 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 0767 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4444444 | 23, | ${ }_{7442}^{170}$ | 7374 | 7305 | ${ }_{7236}^{8969}$ | 7168 | ${ }_{7}^{8835}$ | ${ }^{87808}$ | ${ }^{870061}$ |  |  | ${ }^{0356}$ |  | ${ }^{0.553}$ |  |  |  |  |  |  |  |
|  |  | 57 | 5645 | 558 | 537 | 5434 | 5363 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 17 |  |  |  |  |  |  |  | ${ }_{337} 740$ |  |  |  |  |
|  |  | 0532 | 0457 | 0382 | 0307 | ${ }^{0231}$ | 0.56 | 0081 | H005 | 37.9930 |  | 18448 | [8588 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 53 | 52 | 5 |  |  | 4949 | ${ }_{48} 8$ | 478 |  |  |  |  |  |  |  |  | 607 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{0}^{19258}$ | ${ }^{181} 1$ |  | ${ }_{9929}$ | 11644 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8526 |  | 8353 | 8266 | 8179 | 8093 | 8006 | 79 | 7832 |  |  |  | 7904 | 2203 | 8159 | ${ }^{2287}$ | 8414 | 4 |  |  |  |
|  |  | ${ }_{49}^{67}$ | ${ }_{48}^{66}$ | ${ }_{4835}^{6535}$ | ${ }_{4} 644$ | ${ }_{4624}^{6388}$ | ${ }_{4534}^{627}$ | ${ }_{6}^{6182}$ | 4354 |  |  | 901 |  |  |  |  | 404 |  |  |  |  |
|  | 3348 | 325 | 3165 |  | 2982 | 2890 |  | 270 | 2615 |  |  | 4632 | 476 | 4901 | 5036 | 5171 | 305 | 540 | 575 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 807 |  | 7881 | 7785 |  | 7591 | 749 | 739 |  |  | 148 |  |  | 1913 | 2055 |  |  |  |  | ${ }_{59}$ |
|  |  |  |  |  | 6052 |  | 5856 | 575 | 565 | 40.5 |  |  |  |  |  |  |  |  |  |  |  |
| 66 <br> 63 <br> 63 <br> 64 <br> 65 |  |  | ${ }^{459}$ | 4 | ${ }^{43}$ | 42 | 4238 | 402 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 126 | 116 | 1061 |  |  |  |  | 0545 |  |  |  | ${ }^{23931}$ | ${ }_{413}^{8492}$ | ${ }_{4264}^{8841}$ | ${ }_{4}^{8796}$ |  |  |  |  |  |  |
|  |  | 948 | ${ }^{9332}$ | 92 | 91 | 90 | 8917 | 888 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 2192 |  | 1970 | 185 | 1774 |  |  | 257 | ${ }_{7838}^{2217}$ | ${ }^{2380}$ | 2544 | 2707 |  |  |  |  |  |
|  |  | 907 | ${ }^{8956}$ | 8842 |  | ${ }_{8613}$ |  | ${ }_{8384}$ |  | 57815 | 993121 |  | 3458 | ${ }_{3627}^{8003}$ |  | 3963 |  |  | ${ }_{448}^{8833} 4$ |  |  |
|  | ${ }_{57}^{743}$ | 561 | 5498 |  |  |  |  | 4909 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 40 | $\begin{array}{\|c} 308 \\ 388 \\ 168 \end{array}$ | 3769 | 9 | 353 | 34 | 3295 | 3171 |  |  |  | ${ }^{1} 145$ | 0321 | 0496 | 0672 | 0848 | 1023 |  | 138 |  |  |
|  | 2556 | ${ }_{04}^{218}$ | 2030 | 11918 | 1065 | 1972 | 18820 | ${ }^{1693}$ | ${ }_{957} 1$ | 61. 61. | 12 | ${ }_{1382}^{5764}$ | ${ }_{156}^{594}$ | 174 | ${ }_{193}^{6298}$ |  |  |  |  |  |  |
|  | 8830 |  |  |  |  | 82 | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 63 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 352 | 3394 | 326 | ${ }_{3135}$ | ${ }_{3006}$ | 2877 | ${ }_{274}^{4285}$ | ${ }_{261}^{437}$ | ${ }_{65}^{642488}$ |  | ${ }_{3856}^{223}$ | 8424 |  |  | 461 | 980 | ${ }^{396}$ |  |  |  |
|  |  | 179 | 1664 | 1534 |  |  | 1141 |  |  |  | $44 \cdot 9282$ |  |  | 985 | ${ }_{0}^{4052}$ |  |  |  |  |  |  |
|  |  | .068 | ${ }_{82}^{99}$ | ${ }^{9803} 8$ | ${ }_{7938}^{2670}$ | 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 66 |  | 63 | 6205 | 6069 | 5934 | 57 | 56 | 68.5 |  | 6330 | 652 | 6729 | 692 | 7128 | 7328 | 7527 | 772 |  |  |
|  | 32 | ${ }^{4885}$ | ${ }_{3019}^{4748}$ | 289 | 2740 | ${ }_{2601}^{4335}$ | ${ }_{2462} 4$ | ${ }_{2323}^{4060}$ | 31823 |  | 77362 | 7566 | 777 | 197 |  |  | 8589 |  | ${ }^{3362}$ |  |  |
|  |  | 13 | 125 | 1148 | ${ }^{1008}$ | ${ }^{0867}$ | 072 | 0.585 | 04 |  |  |  | ${ }^{3392}$ |  | 3805 | 4012 | 4219 | 4426 | ${ }^{6632}$ |  | 86 |
|  |  |  |  |  |  |  |  | 88 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 5665 | 5519 | 537 | 522 |  |  | 220 | 254 | ${ }_{0}^{4845}$ | ${ }_{0682}^{5057}$ | 0896 | 5480 | 1324 |  |  |  |
|  | 460 | 4520 |  |  |  | 3931 |  |  | 3488 | 44344 | 0.5442 | 5659 | 5875 | 6092 | 6308 | ${ }_{5} 52$ | 6741 | 6957 | 7173 |  |  |
|  |  |  | 26 | ${ }_{0}^{24}$ | ${ }_{061}^{236}$ | 21 | ${ }^{2048}$ |  | 17 |  |  |  |  |  |  |  |  | 2590 |  |  |  |
|  |  | ${ }_{93}$ | 91 | 90 | 8881 | 8728 | 857 | 842 | 8 |  | 2290 | 2514 | 717 | 7388 |  | 7788 | ${ }^{3002}$ | ${ }_{385}^{822}$ | 84 |  | 32 |
|  |  |  |  |  |  |  |  |  |  |  |  | 8132 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{43} 1$ | ${ }_{4}^{454}$ | 2397 | 384 | 3683 | ${ }^{3526}$ | 36 | 321 | ${ }^{3054}$ |  |  | 939 | 960 | 9831 | P062 | 0293 | 0523 | 0754 |  |  | ${ }^{6}$ |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 888 | 8324 | , |  | 837 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 6.16 |  |  |  |  | 2805 |  |  |  |  |  |
|  |  |  |  |  |  | 45 | 44 | $4{ }^{3}$ | 42 | ${ }_{4}{ }^{1}$ |  |  |  |  |  | $45^{\circ}$ |  | ${ }^{43}$ | 42 । | $41^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 34 | $4^{\circ} \quad$ Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $34^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $21^{\prime}$ | $22^{\prime}$ | ［23＇ | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | $27^{\prime}$ | $28^{\prime}$ | $29^{\prime}$ | 20 | $21^{\prime}$ | $22^{\prime}$ | 231 | ［24 | 125 ${ }^{\prime}$ | $26^{\prime}$ | $27^{\prime}$ | $28^{1}$ | $29^{7}$ |  |
| ， | 8258 | 8256 | 8254 | 8253 | 82 | 82 | 82 | 8246 | 82 | 824 | ． 564 | 5642 | 5645 | 564 | 5650 | 565 | 56 | 5657 | 5659 | 5662 |  |
| 2 | 65 | 651 | 650 | 650 | 6502 | 64 | 6496 | 6492 | 648 |  | T280 | 28 | 1290 | 129 | 1299 | 1304 | 1309 |  |  |  |  |
| 3 | 4773 | 4768 | 4763 | 4758 | 4753 | 4748 | 4744 | 4739 | 473 |  |  | 6927 | 693 | 6942 | 6949 | 695 | 696 | 6971 | 6978 | 6985 |  |
| 4 | 303 | 3024 | 3018 | 3011 | 3005 |  | 2991 | 2985 | 2978 | 2 | ． 25 | 2570 | 25 | 2589 | 2599 | 2608 | 2618 | 2627 | 2637 | 2647 |  |
| 5 | 1289 | 80 |  |  |  |  | 39 |  | 123 | 4.1215 |  | 8212 | 822 | 8236 | 8248 | 260 | 827 | 828 | 829 | 8308 |  |
| 6 | 95 | 9536 | 9527 | 9517 | 9507 | 9497 | 9487 | 9477 | 9467 | 4.9457 | 3.3840 | 3855 | 3869 | 3884 | 3898 | 3912 | 3927 | 3941 | 3956 | 3970 |  |
| 7 | 78 | 7792 | 7781 | 7769 | 77 | 7746 | 7735 | 7723 | 771 |  |  |  | 95 | 95 |  | 9564 | 9581 | 9598 | 9615 |  |  |
| 8 | 606 |  | 6035 | 6022 | 60 |  | 5983 | 597 | 5956 | 6.59 | 4.512 | 51 | 51 | 51 | 5197 | 5217 | 523 | 525 | 5274 | 5293 |  |
|  | 4319 | 430 | 429 | 427 | 426 | 424 | 4231 | 4216 | 4201 |  |  | 07 | 0804 | 082 | 0847 | 086 | O8 | 091 | 09 |  |  |
| 10 | 2577 | 2561 | 2544 | 2528 | ， | 2495 | 2478 | 462 | 2446 | 8.2429 | ， | 6425 | 6449 | 647 | 6497 | 6521 | 65 | 6569 | 6593 | 17 | 10 |
| 11 | 083 | 0817 |  |  |  |  |  |  |  | 9.0672 |  | 2067 | 2094 |  |  |  | 2199 |  |  |  |  |
| 12 | 909 | 9073 | 905 | 90 |  |  |  | 8954 | 8935 |  |  |  | 7738 |  |  | 7825 | 7854 |  |  | 240 | 12 |
| 13 | 7350 | 7329 | 730 | 7286 | 7265 | 7243 | 7222 | 720 | 717 | $10 \cdot 71$ | \％ | 3352 | 33 | 34 | 3446 | 347 | 350 | 3539 | 3570 | 3602 | 13 |
| 14 | 5608 |  | 55 | 5539 | 55 |  | 5470 | 5447 | 542 |  | $7 \cdot 89$ | 89 | 90 | 9062 | 9095 | 912 | 916 | 9196 | 30 | 26 | 14 |
| 15 | 3866 | 3841 | 3816 | 3792 | 37 | 42 | 18 | 3693 | 3668 | 12. | ． 4601 | 463 | 467 | 4709 | 4745 | 478 | 481 | 485 | 4889 | 492 | 15 |
| 16 | 2123 | 2097 | 2071 | 2044 | 2018 | 1992 | 1966 | 1939 | 1913 | 13. | 9.0241 | 0279 | 0318 | 03 | 0395 | 0433 | 0472 | 0510 | 0548 | 0587 | 6 |
| 17 | 03 | 0353 | 0325 | 029 |  |  | 0213 | 0185 | 0157 | 14.012 | $9 \cdot 58$ |  |  | 604 | 604 | 6085 | 6126 |  | 6208 |  |  |
| 18 | 8639 | 860 | 85 | 8550 | 8520 |  | 8461 | 8432 | 8402 | 14.8372 | 10.15 |  | 1608 | 1651 | 1694 | 173 | 178 | 1824 | 1867 | 191 | 18 |
| 19 | 689 | 6865 | 6834 | 6803 | 6 |  |  | 6678 | 64 | 1568 | $10 \cdot 71$ |  | 72 | 29 | 7344 | 738 | 743 | 748 | 7526 |  |  |
| 20 | 51 | 5121 |  |  |  |  | 4957 | 4924 | 4891 | 16.485 | 11 |  | 2897 | 294 | 93 |  | 3089 | 313 | 318 | 323 | 20 |
| 21 | 34 | 3377 | 3343 |  |  |  |  |  |  |  |  |  |  |  | 343 |  |  | 8794 |  |  | 21 |
| 22 | 1669 | 163 | 159 | 156 | 152 | 1489 | 1453 | 1416 | 1380 | 18 |  |  |  | 4240 | 429 | 4346 | 43 | 4451 | 4504 | 4557 | 22 |
| 23 | 9927 | 9889 | 9852 |  |  |  |  | 9663 | 9625 | 18.958 | 12.97 |  |  |  |  | 99 | ＋0 | 0108 | 0163 | 218 | 23 |
| 24 | 8185 | 814 | 8106 | 8067 |  |  | 7948 | 7909 | 78 | 19.7830 |  |  | 5477 | 55 | 5592 | 565 | 5707 | 5765 |  | 588 | 24 |
| 25 | 6443 | 6402 | 6361 | 631 | 78 | 62 | 6196 | 6155 | 611 | $20 \cdot 607$ | 14. | 106 | 112 | 118 | 1242 | 130 | 136 | 142 | 1482 | 1542 | 25 |
| 26 | 470 | 4658 | 46 | 457 | 45 | 4487 | 4444 | 4401 | 43 | 21. | 14. | 67 | 6767 | 682 | 6891 | 6954 | 7016 |  | 7141 | 203 | 26 |
| 27 | 29 |  |  |  |  |  |  |  | 2603 | 22.255 |  |  | 2411 | 2476 |  | 26 | 26 | 2735 | 800 |  | 27 |
| 28 | 121 | 117 | 1124 | 1078 | 1032 |  | 0940 | 0894 | 0848 |  |  |  | 805 | 8124 | 819 | 82 | 832 | 8392 | 8459 | 852 | 28 |
| 29 | 9473 | 9426 |  |  |  |  |  |  |  | 23.9044 | 16 |  |  |  |  | 39 | 398 | 4049 | 4119 |  | 29 |
| 30 | 773 | 7682 |  |  |  |  |  | 7386 | 7337 | 24.7287 | 169202 | 9274 | 9346 | 9418 |  | 9562 | 963 | 970 |  |  | 30 |
| 31 | 5989 | 5938 |  |  |  |  |  |  |  | $25 \cdot 5530$ |  |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 4246 | 4194 | 414 | 4089 | 40 |  |  |  | 3826 | 26 |  | 05 | 0636 |  |  |  | 0943 |  |  |  | 32 |
| 33 | 25 | 24 | 239 |  |  | 2233 | 2179 | 2125 |  | 27 | 18 |  |  | 63 | 643 | 65 | 65 | 6677 | 675 | 683 | 33 |
| 34 | 076 | 070 | 0650 |  |  |  | 0427 | 03 |  |  |  | 18 |  |  | 208 | 217 | 22 | 233 | 2415 | 249 | 34 |
| 35 | 9020 | 896 | 8905 |  |  |  | 8675 | 86 |  | $28 \cdot 8502$ | 19 | 74 | 75 | 7654 | 7738 | 7822 | 79 | 7990 | 4 | 158 | 35 |
| 36 | 7277 | 7218 | 7159 |  |  | 6982 | 6922 | 6863 | 6804 | 29．6745 | 20.3042 | 3129 | 3215 | 3302 | 3388 | 3475 | 3561 | 3647 | 3734 | 3820 | 36 |
| 37 | 553 | 5474 | 541 |  |  |  |  |  |  | 30．4988 | $20 \cdot 86$ |  |  |  | 038 | 9127 | 92 |  |  |  |  |
| 38 | 3793 | 37 | 3668 | 3606 | 3543 | 34 | 3418 | 3356 | 329 | 31.32 | 21•43 | 44 | 45 | 45 | 46 | 47 | 487 | 4961 | 5052 | 14 | 38 |
| 39 | 2050 | 19 | 1922 | 1858 |  | 1730 |  |  |  | 32．147 | 21.99 |  |  | 02 | 0337 | 043 | 052 | 0618 | 0711 | 80 | 39 |
| 40 | 0308 | 0242 | 0177 |  |  |  | 9914 |  | 9782 | 32.9716 | $22 \cdot 5603$ | 5699 | 5795 | 5891 | 5987 | 6083 | 6179 | 6275 | 6371 | 646 | 40 |
| 41 | 85 |  |  |  |  |  |  |  |  | $33 \cdot 7959$ |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 68 | 675 | 668 | 66 | 65 |  |  |  |  | 34．62 |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 508 | 501 |  |  |  | 4728 | 4657 |  | 4516 | 35．444 | 24 | 2626 | 2729 | 2833 | 2936 | 3039 | 3142 |  | 348 | 345 |  |
| 44 | 3339 | 3267 | 319 | 312 | 3050 | 297 | 2905 | 283 | 27 | 36 | 24 | 82 | 837 | 84 | 85 | 86 | 879 | 8902 | 9008 |  | 44 |
| 45 | 1597 | 1523 | 1449 | 137 | 1301 | 1227 | 53 | 107 | 100 | 37.0931 | $25 \cdot 38$ | 39 | 4019 | 4127 | 423 | 43 | 硣 | 45 | 4667 | 477 | 45 |
| 46 | 9854 | 9779 | 9703 | 9628 | 9552 | 9477 | 9401 | 9325 | 9250 | $37 \cdot 9174$ | 25.9443 | 9553 | 9664 | 9774 | 9885 |  | 1106 |  |  |  | 46 |
| 47 | 811 | 8035 | 795 |  |  | 7726 |  |  |  | 38.7417 | 26.508 |  |  |  | 534 |  | 5760 |  |  | 098 |  |
| 48 | 637 | 629 | 6212 | 61 | 6054 | 5976 | 589 |  |  |  | 27 |  |  |  | 1184 |  |  |  |  |  |  |
| 49 | 462 | 45 | 4467 |  |  | 4225 | 4145 | 4064 | 398 | 40.39 | $27 \cdot 63$ | 64 |  | 67 | 683 | 69 |  | 187 | 304 | 42 |  |
| 50 | 288 | 2803 | 2721 |  | 25 | 2475 | 2392 | 2310 | 2228 | 41.2145 | 28.2003 | 2123 | 224 | 2364 | 2484 | 260 | 272 | 2843 | 2963 | 308 |  |
| 51 | 11 | 105 |  |  | 0808 | 0724 | 64 | 055 |  |  | 28.76 |  |  |  |  |  |  |  |  |  |  |
| 52 | 94 | 9315 | 9230 | 914 |  |  |  |  |  |  |  |  |  |  |  |  |  | 4157 |  |  |  |
| 53 | 76 | 75 | 7484 |  |  | 23 | 7136 |  |  | 43 | 28 |  |  | 930 | 9433 |  |  |  |  | 06 |  |
| 54 | 591 | 58 |  |  |  | 5473 |  |  | 52 | 44.5 |  | 469 | 48 | 49 |  |  |  |  |  |  |  |
| 55 | 4174 | 83 | 3993 | 39 | 3812 | 3722 | 3632 |  | 365 | 45.33 | 31.02 | 033 |  | 060 | 0732 | 0864 | 0996 | 128 | 260 | 392 | 55 |
| 56 | 2431 | 2339 | 2248 |  |  |  |  |  |  | $46 \cdot 1603$ | 31.584 |  |  |  |  |  |  |  |  |  |  |
| 57 | 068 | 059 | 0502 | 0408 | 0315 | 02 | 127 | －034 | 9940 | 46 | 32 |  |  | 189 | 203 | 21 | 23 |  |  |  |  |
| 58 | 894 | 885 | 87 |  |  | 847 | 8375 |  |  | 47 |  |  |  |  |  |  |  |  |  |  |  |
| 59 | 720 |  |  |  |  | 20 | 6623 |  |  | $48^{\circ}$ | 39． |  |  | 183 | 3331 |  |  | 3755 |  | 03 |  |
| 60 | 5462 | 536 | 5265 | 5167 | 5068 | 4969 | 871 | 477 | 467 | 457 | 33．88 | 85 | 869 | 883 | 898 | 912 | 92 | 41 | 556 | 700 | － 6 |
| 61 | 37 |  |  |  |  | 321 |  |  |  |  |  | 41 |  |  |  |  |  |  |  |  |  |
| 62 | 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 023 | 013 | ＋0 | 9925 | 9822 | 9718 | 9614 | 951 |  | 51 | $35 \cdot 53$ |  | 562 | 577 | 592 |  | 623 | 6383 | 653 | 668 |  |
| 64 | 84 |  | 828 |  |  | 7967 | 7862 |  |  | 52.7546 |  |  |  | 1425 |  |  |  |  |  |  |  |
| 65 | 67 |  |  |  |  |  |  |  |  | $53 \cdot 578$ | 仡 |  |  |  |  |  |  |  |  |  |  |
| 66 | 5008 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 326 | 315 | 30 | 293 | 28 | 271 | 260 | 249 | 238 | 55.22 | $37 \cdot 78$ |  |  | 83 | 852 |  | 8849 |  |  |  |  |
| 68 | 157 | 1412 |  |  |  |  | 085 | 0742 | 0630 | 56.05 | $38^{\circ}$ |  |  | ， | 178 |  |  |  |  |  |  |
| 69 | 978 | 9668 | 9555 |  |  |  |  |  | 887 | $56 \cdot 87$ |  |  |  | 9662 | 9827 |  |  | 0324 | 048 |  |  |
| 70 | 8039 | 792 | 7809 | 7694 | 75 | 7464 | 7349 | 723 | 711 | 57.700 | 39.4805 | 49 | 514 | 53 | 547 | 564 | 5813 | 598 | 6149 | 631 |  |
| 71 | 6297 | 6180 | 60 | S | 5831 | 5714 | 5597 | 548 | 536 | 524 | $40^{\circ} 04$ | 061 | 078 | 095 | 1127 |  | 左 | 1630 |  |  |  |
| 72 | 45 | 443 | 43 |  |  |  |  | 位 |  | 59•3489 |  |  |  |  |  |  |  |  |  |  |  |
| 73 | 2812 | 2693 | 2573 | 2453 | 2333 | 2213 | 2093 | 1973 | 1853 | $60 \cdot 17$ | $41 \cdot 17$ | 19 | 207 | 225 | 2426 | 260 | 277 | 295 | 312 | 330 |  |
| 74 | 107 | 0949 | 08 |  |  | 62 | 0341 | 021 | 1097 | 60．997 | 4173 | 75 | 772 | 789 | 807 | 82 | 843 | 8608 | 878 | 896 |  |
| 75 | 932 |  |  |  |  |  |  |  |  | 821 |  | 3185 |  |  |  |  |  |  |  | 462 |  |
| 76 | 7585 |  |  |  |  |  | 683 |  |  |  | 42 | 827 | 9010 |  |  |  | ， |  |  |  |  |
| 77 | 5843 | 571 | 55 | 546 | 53 | 5211 | 508 | 4958 | 483 | $63 \cdot 470$ | 43＊428 | 4470 | 465 | 484 | 502 | 52 |  |  | 576 | 59 |  |
| 78 | 410 |  |  |  |  |  | 3332 |  | 1 | －29 |  | ， | 析 | 48 | 0674 |  | 研 | 23 |  |  |  |
| 79 | 2359 | 2229 | 209 | 1969 | 1840 | 1710 | 15 | 1450 | 1320 | $65 \% 190$ | 44.55 | 575 | 594 | 613 | 6324 | 65 | 670 | 689 | 708 | 727 |  |
| 80 | 0616 | 06 | 0354 | 0222 | 91 | 9959 | 9828 | 969 | 956 | 65.9433 | $45 \cdot 120$ | 1397 | 159 | 178 | 197 | 21 | 2358 | 2549 | 2741 | 293 |  |
| 81 | 88 | 87 |  |  |  |  | 8076 |  |  |  |  |  |  |  | 762 |  |  |  |  |  |  |
| 82 | 732 | 699 | S061 | 672 | － | 6458 | 6323 | － | 60 | 67．5919 | 46243 | 268 | 287 | 3076 | 223 | 948 | 366 | 3863 | 4060 |  |  |
| 83 | 5389 | 525 | 511 | 498 | 48 | 4708 | 45 | 4435 | 4298 | 68.416 | $46 \cdot 812$ | 8325 | 8524 | 872 | 8923 | 912 | 932 | 95 | 971 | 991 |  |
| 84 | 3647 |  | 317 |  |  | 2087 | 2819 | 26 | 2543 | 240 |  | 396 | 4169 | 437 | 457 | 47 | 497 | 517 | 537 | 558 |  |
| 85 | 1905 | 1765 | 1626 | 486 | 1346 | 1207 | 1067 | 0927 | 0787 | 70．0647 | $47 \cdot 940$ | 961 | 981 | ＊ 01 | 022 | 042 | 063 | 083 | 103 | 124 |  |
| 86 | 0162 | ＋021 | 988 | 19739 | 9598 | 456 | 9315 | 9173 | 903 | 70 | 48.50 | 525 | 5459 | 5665 | 587 | 607 | 628 | 6491 | 669 | 903 | 86 |
| 87 | 8420 | 827 | 8135 | 792 | 7849 | 析 | 7563 | 7420 | 727 | 71 | 49 |  | 1104 | 1312 | 1521 | 173 | 939 | 14 | 2356 | 25 |  |
| 88 | 667 | 653 | 6389 | 62 | 6193 | 5955 | 581 | 56 | 5761 | 72 | 49.63 | 6537 | 678 | 696 | 171 | 730 | 593 | 砛 |  | 822 |  |
| 89 | 493 | 479 | 464 | 449 | 4351 | 4205 | 405 | 391 | 376 | 73.361 | 50.196 | 2180 | 239 | 260 | 282 | 30 | 32 | 346 | 367 |  |  |
| 90 | 3193 | 3046 | 2898 | 2750 | 2602 | 2454 | 306 | 2158 | 201 | 74．1862 | 50.760 | 782 | 803 | 8254 | 8470 | 8686 | 8902 | 9118 | 9334 | 955 | 90 |
| 91 | 145 | 1302 |  |  |  |  | 555 |  |  |  | 5132 |  |  |  |  |  | 127 |  |  |  |  |
| 92 | 9709 | 9558 | 45 | ， |  | 8953 | 88 | 865 | 8499 | 75．834 | 51 ＇888 | 9107 | 9328 | 954 | 977 | 998 | －21 | 043 | 6 6 | 087 |  |
| 93 | 796 | 7814 | 661 | 75 | 7356 | 7203 | 7050 | 6897 | 674 | 76.659 | 52.45 | 4749 | 497 | 519 | 541 | 56 | 58 | 6089 | 63 | 653 |  |
| 94 | 6224 | 6070 | 5915 | \％ | 析 | 5452 | 529 | S143 | 498 | 7843 | 53.016 | 0392 | 618 | 884 | 106 | 129 | 520 |  | 析 | 237 |  |
| 95 | 4482 | 4326 | 4170 | 4014 | 858 | 3702 | 3545 | 338 | 323． | $78 \cdot 3076$ | 53.5806 | 6034 | 626 | 649 | 671 | 69 | 117 | 740 | 7630 | 785 | 95 |
|  | 27 | 2582 | 2424 | 2267 | 2109 | 195 | 179 | 1635 | 1477 | 9 | 54．1446 | 1677 | 1907 | 213 | 236 | 25 | 2829 | 3059 | 3290 | 3520 | 96 |
|  | 0997 | 0838 | 0679 | 0519 |  | 0201 | P41 | 9882 | 9722 | 9562 | 54.7086 | 7319 | 7552 | 778 | 8018 | 825 | 848 | 8716 | 94 | 918 |  |
|  | 925 |  | 8933 |  | 8611 | 8450 | 828 | 81 | 7966 | $80 \cdot 780$ | 55.272 | 2962 | 3197 | 3432 | 366 | 39 | 413 | 437 | 4608 | 4843 |  |
|  | 7513 | 7350 | 7188 | 7025 | 6862 | 6700 | 6537 | 6374 | 6211 | 81．6048 | 55.8367 | 8604 | 8842 | 9080 | 9317 | 9555 | 9792 | 1030 | 0267 | 0505 | 99 |
| 100 | 5770 | 5606 | 42. | 5278 | 5114 | 4949 | 4785 | 4620 | 4456 | 82.429 | 56：4007 | 4247 | 4487 | 4727 | 4967 | 5207 | 5447 | 5687 | 5927 | 6167 | 100 |
|  | $40^{\prime}$ | $39^{\prime}$ | 38 | $37^{\prime}$ | $36^{\prime}$ | $35^{\prime}$ | $34^{\prime}$ | 33 | 32 | $31^{\prime}$ | $40^{\prime}$ | $39^{\prime}$ | 38 | 37 | 36 | $35^{\prime}$ | 3＇ |  | $32^{\prime}$ | $31^{1}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES


TRAVERSE TABLES．

| 3 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $34^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | $52^{1}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | 58 | 59 | $50^{\prime}$ | 51 | 62＇ | 53 | 54 | $55^{\prime}$ | 56 | 57 | 58 | $59^{\prime}$ |  |
|  | 820 | 820 | 8205 | 8203 | 82 | 8200 | 8198 | 8197 | 81 | 8193 | 5712 | 5714 | 5717 | 5719 | 57 | 572 | 572 | 57 | 5731 | 5733 |  |
|  | 64 | 6413 | 6410 | 6406 | 6403 | 6400 |  | 6393 |  | $\cdot 638$ | 1.1424 | 14 | 143 | － | 1443 | 1448 | 145 | 14 | 1462 | 1467 |  |
|  | 462 | 462 | 4615 | 46 | 460 | 460 | 45 | 4590 | 45 |  |  |  | 71 |  |  | 7172 | 717 |  | 7193 |  |  |
|  | 2833 | 2826 | 2819 | 2813 | 2806 | 279 | 2793 | 2786 | 2779 | $3 \cdot 277$ | ．2848 | 285 | 2867 | 2876 | 2886 | 2895 | 2905 | 29 | 2924 | 2934 |  |
| 5 | 104 |  | 1024 | 1018 | 102 | 0999 |  |  | 09 | 296 | $2 \cdot 8560$ | 857 | 8583 | 8595 | 8607 | 8619 | 863 | 8643 | 8655 | 8667 |  |
| 6 | 924 | 92 | 9229 | 9219 | 9209 |  |  |  |  |  |  | 288 |  | 4314 | 4329 | 4343 | 4357 | 4372 | 4386 |  |  |
|  | 7457 |  |  | 7422 |  |  |  |  |  |  |  |  |  |  |  | 0067 |  |  |  | 134 |  |
|  | 5665 | 565 | 563 | 5625 | 5612 | 559 | 558 | 5572 | 555 | 554 |  | 571 | 57 | 57 | 5772 | 579 | 5810 | 5829 | 5848 | 5867 |  |
|  | 387 |  |  |  |  | 379 | 378 | 69 | 37 |  | $5 \cdot 1407$ | 1429 | 145 | 14 | 1493 | 1515 | 1536 | 155 | 1579 | 1600 |  |
| 10 | 208 | 2065 | 2048 | 2032 | 2015 | 1999 | 1982 | 1965 | 1949 | 8．1932 | 5．7119 | 7143 | 7167 | 7191 | 7215 | 723 | 7262 | 7286 | 7310 | 7334 | 10 |
| 11 | 029 | 0272 | 0253 | 0235 | 0217 | 0198 | 0180 | 0162 | 0143 | 9.012 | 6.2831 | 285 | 288 | 2910 | 2936 | 29 | 2989 | 3015 | 3041 | 3067 | 1 |
| 12 | 849 | 847 | 84 | 848 | 841 | 83 | 837 |  | 833 | 9 |  | 85 |  | 86 | 86 | 8686 | 871 | 8743 | 87 |  | 2 |
| 13 | 670 |  |  | 6641 | 6620 | 65 | 657 | 655 | 6533 | 10.65 | $7 \times 425$ | 42 | 4317 | 4348 | 989 | 4410 | 4441 | 4472 | 4503 | 45 | 13 |
| 14 | 491 | 489 | 4868 | 48 | 4821 | 47 | 477 | 47 | 472 | 11.47 |  | ＋000 | 0034 | 00 | 01 | 01 | －181 | 021 | 0234 | 0267 | 14 |
| 15 | 3123 | 309 |  |  | 30 |  | 2973 |  | 29 | 12289 | 8．5679 |  | 57 | 57 | 58 | 5858 | 589 | 5929 |  | 600 | 15 |
| 16 | 1331 | 1304 |  |  |  |  |  |  |  |  |  | 1429 |  |  |  |  |  |  |  |  | 6 |
| 17 | 953 |  | 9482 | 9454 | 9426 |  |  |  |  |  | 97103 |  |  |  |  | 7305 | 7346 |  |  |  |  |
| 18 | 77 | 77 | 7687 | 7657 | 7627 | 759 |  |  | 7507 | 14.7 | 10.28 | 285 |  | 2943 |  | 3029 |  | 3115 |  | 320 | 18 |
| 19 | 595 | 59 |  |  | 5829 |  |  | 573 | 5702 | $15 \cdot 56$ | $10 \cdot 85$ | 857 | 8617 |  | 8708 | 8753 | 87 | 8844 |  | 8934 |  |
| 20 | 4163 | 4130 | 409 | 64 | 4030 | 399 | 3964 | 3930 | 997 | 16.38 | 11 | 428 | 433 | 438 | 44 | 4477 | 4525 | 457 | 4620 | 4668 | 20 |
| 21 | 237 | 2337 | 2302 | 2267 | 223 | 21 | 21 | 2127 | 2092 | 17 | 11. | －000 | 005 | 01 | 015 | 02 | 0251 | 0301 | 0351 | 040 | 21 |
| 22 | 05 | 05 |  |  | 0433 |  |  |  | 0287 | 18.02 |  |  |  |  |  | 5925 | 597 | 60 |  | 61 | 22 |
| 23 | 878 | 87 | （1） | 8673 | 8635 | 859 |  |  | 8482 |  |  |  |  |  | 1594 | 1648 | 1703 | 175 | 1813 | 1868 | 23 |
| 24 | 699 | 69 | 6 | 6876 | 6836 | 679 | 675 | 67 | 667 | 19 |  | 714 | 72 | 7258 | 7315 | 7372 | 74 | 7487 | 7544 | 760 | 24 |
| 25 | 5204 | 5163 | 5121 |  | 5038 | 4996 | 4955 | 49 | 4871 | 20 | 14．2798 | 285 | 29 | 29 | 3036 | 3096 | 3156 | 3215 | 3275 | 3335 | 25 |
| 26 | 34 |  |  |  |  |  |  |  |  |  | 14.8510 |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 162 | 15 |  |  | 144 |  |  |  |  |  |  |  |  |  |  | 45 | 4608 | 467 |  |  |  |
| 28 | 98 | 97 | 97 |  | 9643 | 959 | 954 |  | 945 |  |  |  |  |  |  |  | 0334 | 04 |  | 053 | 28 |
| 29 | 883 | 79 |  |  | 804 |  |  |  | 7651 |  | 1 |  |  | 5853 | 592 | 599 | 606 | 61 |  |  |  |
| 30 | 624 | 6195 | 61 | 95 | 6046 | 59 | 5946 | 5896 | 346 | 24.5796 | $17 \cdot 13$ | 142 | 150 | 15 | 164 | 171 | 178 | 1858 | 1930 | 200 | 30 |
| 31 | 44 | 4402 | 43 | 4299 | 4247 | 4195 | 4144 | 4092 | 4041 | 25.3989 | $17 \cdot 70$ | 7143 | 721 | 729 | 736 | 7439 | 7513 | 7587 | 7661 | 7735 | 31 |
| 32 | 266 |  |  | 2502 | 2449 |  |  |  |  |  | 18.27 |  | 29 |  |  | 3163 |  |  |  |  | 32 |
| 33 | 087 | 081 |  | 0705 | 0650 |  |  |  | 0430 |  | 18 | 857 |  |  |  | 8887 | 996 |  |  |  |  |
| 34 | 907 | 902 | 896 | 8908 | 8852 |  | 873 | 8682 | 8625 |  | 19 | 428 | 436 | 4448 | 4530 | 4611 | 469 | 4773 | 4854 | 493 |  |
| 35 | 7286 | 7228 | 7170 | 7111 | 7053 | 699 | 6937 |  | 6820 | 28.6762 | 19 | －000 |  | 0168 |  | 0335 | 0418 | 0501 | 0585 | 0668 | 35 |
| 36 | 5494 | 5434 | 5374 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 36 |
| 37 | 370 |  |  | ， | 345 |  |  |  |  |  |  |  |  |  |  | 178 | 1870 |  |  |  |  |
| 38 | 1910 | 1847 | 1784 | 21 | 1658 | 159 | 1531 | 1468 | 1405 | $31 \cdot 13$ | 21 | 714 | 723 |  |  | 7506 | 75 |  |  |  | 38 |
| 39 | 01 | －054 |  |  |  |  |  |  |  | 31．953 | 22.27 |  |  |  |  | 230 | 332 |  |  |  |  |
| 40 | 83 |  | 819 | 8127 | 806 | 799 | 7928 |  | 779 | 32 | 22.847 | 857 | 86 | 87 | 88 | 89 | 9049 |  | 9240 | 933 | 40 |
| 41 | 653 | 6467 | 639 | 6331 | 6262 | 6194 | 6126 | 605 |  | 33.592 | 23．4188 |  |  | 4482 |  | 4678 | 4775 |  |  |  | 41 |
| 42 | 47 | 4673 | 4604 | 4534 | 4464 |  | 432 |  |  |  |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 295 | 288 |  |  | 266 |  |  |  |  | $35 \cdot 23$ | 24.5612 |  |  |  |  |  |  |  |  |  |  |
| 44 | 1159 | 1086 | 1013 |  |  |  |  |  | 057 |  | $25^{\circ} 1324$ | 142 | 153 |  |  |  | 1954 |  |  |  |  |
| 45 | 93 | 9293 | 9218 | 9143 | 9068 | 8993 | 8919 |  | 8769 | 36.8694 | 25 | 7 | 7251 | 7358 | 74 | 7573 | 7680 | 7788 | 7895 | 800 | 45 |
| 46 | 7576 | 7499 |  |  | 7270 |  |  |  |  |  | $26 \cdot 2748$ |  |  |  |  |  |  |  |  |  |  |
| 47 | 578 | 57 | 5628 | 5550 | 5471 | 539 |  | 5237 |  | $38 \cdot 50$ |  |  | 86 |  | 8 | 902 | 9133 |  |  |  |  |
| 48 | 39 | 39 |  |  | 3673 | 359 | 3513 | 3433 | 335 | 39 |  |  |  |  |  |  |  |  |  |  |  |
| 49 |  |  |  |  | 1874 |  |  | 1630 | 1548 | 40 |  |  | 01 |  | 035 | 046 |  |  |  |  |  |
| 50 | 0409 | 032 | 0242 | 0159 | －076 | 999 | 990 | 9826 | 9743 |  | 28 | 57 |  |  | 607 | 619 | 6311 | 643 | 65 |  | 50 |
| 51 | 861 | 853 |  |  | 82 |  | 810 |  |  |  |  | 14 |  |  |  |  |  |  |  |  |  |
| 52 | 68 | 673 | 66 |  | 64 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 503 | 49 | 4857 | 4769 | 4681 | 4592 | 450 | 4416 | 4327 | 43 | 30 |  |  |  |  |  |  |  |  |  |  |
| 54 | 324 | 31 | 30 |  |  |  |  |  |  |  |  |  |  |  |  |  | 9216 |  |  |  |  |
| 55 | 1449 | 135 | 1267 | 1175 |  | 09 | 0900 |  | 07 | $45^{\circ} 0$ | 31：41 | 42 | 44 | 4549 | 4680 | 4811 | 49 | 5074 | 5205 | 533 | 55 |
| 56 | 9658 | 9565 |  |  |  |  |  |  |  | $45^{\circ} 881$ | 31 |  |  |  |  |  |  |  |  |  |  |
| 57 | 78 | 77 | 7676 |  | 7487 | 739 | 729 | 7202 |  | 46 | 32 | 57 |  |  | 研 | 625 | 63 |  |  |  |  |
| 58 | 607 | 59 |  |  |  |  |  |  |  | 47 | $33 \cdot$ |  |  |  |  |  |  |  |  |  |  |
| 59 | 428 |  | 40 |  |  |  |  | 3595 | 34 | 48.33 | $33 \cdot 7003$ |  |  |  |  | 77 |  |  |  |  |  |
| 60 | 24 | 239 | 2291 | 2191 | 208 | 1991 | 1891 | 1791 | 169 | 49 | 34 | 28 | 30 | 31 |  | 343 | 357 | 371 |  | 400 | 6 |
| 61 | 069 |  |  | 039 | 029 | 019 | ${ }^{+0}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 8907 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 71 |  |  |  |  | 65 |  | 6381 |  | －617 |  |  |  |  |  |  |  |  |  |  |  |
| 64 | 532 | 521 | 51 |  | 48 | 479 |  | 4577 | 44 | 52 |  |  |  |  |  |  |  |  |  |  |  |
| 65 | 353 | 34 | 33 |  |  |  |  |  |  | 53 | 37 |  |  |  |  |  |  |  |  | 267 | 65 |
| 66 | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 99 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 815 | 80 | 79 |  | 770 |  | 747 | 7364 | 72 | 55.713 | $38 \cdot$ |  |  | 88 |  |  |  |  |  |  |  |
| 69 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ， | ¢ | 5110 |  |  |  |  |
| 70 | 457 | 445 | 433 | 4223 | 4106 | 399 | 3873 | 3757 | 3640 | 57.35 | 39.98 | －00 | 016 | 033 | 050 | 06 | 083 | 100 | 1170 | 133 | 70 |
| 71 | 27 |  | 2544 | 2426 | 230 | 219 | 207 | 1953 | 1835 | 58 | 40.55 |  |  | 6054 | 622 |  |  |  |  |  |  |
| 7 | 098 |  |  |  |  |  | 02 | － |  | 58 | $41 \cdot 12$ |  |  |  | 1945 | 21 |  |  |  |  |  |
| 73 | 919 |  | 8954 |  |  | 85 | 8468 | 8346 | 8224 | $50^{\circ} 81$ | $41 \cdot 69$ |  |  |  | 766 | 78 |  |  |  |  |  |
| 7 | 7405 | 7282 | 71 |  | 6912 | 67 | 6666 | 6543 | 641 | 60＇62 | 42.268 |  | 303 | 3211 | 33 | 35 | 37 | 39 | 409 | 427 | 74 |
| 75 | 5613 |  |  |  |  |  |  |  |  |  | 42•839 |  |  |  |  | 928 | 94 |  | 9825 |  | 75 |
| 76 | 382 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 77 | 2029 | 1901 | 1773 | 1645 | 1517 | 1389 | 1261 | 113 | 1004 | 63.08 | 43.98 | \＄00 | 01 | 03 | 0552 | 073 | 0920 | 1103 | 1287 | 147 |  |
| 78 | 023 | －108 | 9978 | 9848 | 9718 | 9589 | 9459 | 9329 | 919 | 63．906 | 44.55 | 571 | 59 | 6088 | 6274 | 646 | 66 | 68 | 7018 | 720 |  |
| 79 |  |  |  |  | 7920 |  |  | 7525 | 咗 |  | 45＇1241 | 143 | 173 | 178 | 1995 | 2188 | 237 | 251 | 218 | 2937 |  |
| 80 | 6654 | 6521 | 6388 | 6255 | 6122 | 598 | 5855 | 5722 | 5588 | 65.545 | 45.6953 | 714 | 7335 | 7526 | 7717 | 79 | 809 | 828 | 848 | 867 |  |
| 81 | 48 | 4727 | 4593 | 4458 | 4323 | 418 | 4053 | 3918 | 378 | 66＇364 | 46.26 | 285 | 305 | 32 | 3438 | 36 |  | 40 | 421 |  |  |
| 82 |  |  |  | 2661 | 2525 | 硡 | 225 | 21 | 1978 |  | $46^{\circ} 83$ |  | 8768 | 8964 | 9160 | 935 | 955 |  |  |  |  |
|  | 127 | 1140 | 102 |  | O72 | 258 | 0450 | 0311 | 017 | 68.00 |  |  | 44 | d | 488 | 5079 | 527 | 12 | 5673 |  |  |
| 84 | 948 | 93 | 9207 | 9067 | 8928 | 8788 | 8648 | 8508 | 8368 | 68.82 | 47．980 | －00 | 02 | 04 | 0603 | 085 | 10 | 1204 | 1404 | 16 |  |
| 85 | 7694 |  |  | 析 |  |  |  |  |  |  | 48.5513 | 5715 | 5918 | 121 | 224 | 6527 |  |  |  | 733 | 85 |
| 86 |  |  |  | 547 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 87 | 411 | 3966 | 3822 | 367 | 353 | 3387 | 3242 | 3098 | 295 | $71 \cdot 280$ | 49.69 |  | 735 | 75 |  | 粝 | －81 |  |  | 88 |  |
| 88 | 231 | 2173 | 2026 | 1880 | 173 | 1587 | 1 | 1294 | 147 | $72 \cdot 100$ | 50.26 | 28 | 30 | 32 | 3488 | 369 | 390 | 4118 | 4328 | 453 |  |
| 89 | － |  |  | ， |  |  | ， |  | 1142 |  | $50 \cdot 8360$ | 85 |  | 897 | 9210 | 42 | 93 |  |  | 27 |  |
| 90 | 8735 | 586 | 8436 | 8286 | 813 | 7987 | 7837 | 7687 | 7537 | 73．7387 | 51＊4072 | 428 | 4502 | 4717 | 493 | 51 | 53 | 557 | 579 | 600 | 90 |
| 91 | 6943 |  | 6641 | 6490 | 6338 | 187 | 35 | 5884 | 573 | 74．558 | 51．97 | －0 | 02 | 04 | 0653 | 0870 | 1087 | 1304 | 1521 |  |  |
| 92 |  | 4999 | 4 8 | 469 | 4540 | 4387 | 4233 |  | 3927 |  | $52 \cdot 549$ | 571 | 5935 | 6155 | 6374 | 659 | 683 | 703 | 2s |  |  |
| 93 | 33 | 3205 | 305 | 2896 | 2741 | 2586 | 2432 | 2277 | 2122 | 76．19 | 53．120 | 143 | 1652 | 187 | 209 | 231 | 253 | 27 | 2983 |  | 93 |
| 94 | 1568 | 1412 | 1256 | 1098 | 43 | 0786 | 0630 | 473 | 0316 | 77.016 | 53.692 |  | 736 | 7593 | 7817 | 804 | 826 | 849 | 87 | 893 | 94 |
| 95 | 977 |  | 9460 | 9302 | 9144 | 8986 |  |  | 8511 | $77 \cdot 835$ | 54．2632 | 2858 | 3085 |  | 3539 | 3765 |  | 4218 |  | 467 | 95 |
| 96 | 7984 |  |  | 750 | 7346 | 86 |  | 6866 | 06 |  |  |  | 88 | 9031 | 926 | 948 | 9718 |  |  |  | 96 |
| 97 | 61 |  | 587 | 57 | 5547 | 53 | 5224 | 5063 | 490 | 79.473 | 55.40 | 42 | 45 | 47 | 498 | 52 | 54 | 56 |  | 6138 |  |
| 98 | ， | 4238 | 4075 | 位 |  | 3586 |  | 259 | 3096 | 293 |  | 001 | 0235 | 468 | 0703 | 093 | 1170 | 4， | 1638 | 87 |  |
|  | 2609 |  |  |  |  |  |  | 1456 | 129 | 81.1126 | 56.547 | 5716 | 595 | 618 | 6424 | 66 | 689 | 713 | 7369 | 760 |  |
| 00 | 0817 | 0651 | 0485 | 0318 | ＋152 | 9985 | 9819 | 9652 | 4486 | 81．931 | 57．1191 | 1430 | 1669 | 1907 | 2146 | 2384 | 2623 | 286 | 3100 | 3338 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ | $1^{1}$ | $1{ }^{\prime}$ |  |  |  | $6^{\prime}$ | ${ }^{\prime}{ }^{\prime}$ | $4^{\prime}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


## TRAVERSE TABLES．

| $35^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $35^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11^{\prime}$ | 12 | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | 16 | 17 | 18 | $19^{\prime}$ | $10^{\prime}$ | $11^{1}$ | $12^{\prime}$ | 13＇ | 14 | $15{ }^{\prime}$ |  | 17 |  |  |  |
|  | 817 | 8173 | 8171 | 8170 | 8168 | 8166 | 816 | 8163 | 81 | 8160 | 5760 | 5762 | 576 | 5767 | 5769 | 5771 | 5774 | 5776 | 5779 |  |  |
|  | 635 | 6346 | 6343 | 6340 | 63 | 6333 | 632 | 63 | 632 | 63 | 19 | 152 | 15 | 153 | 1538 | 1543 | 1548 | 1552 | 1557 | 562 |  |
|  | 4524 | 4519 | 4514 | 450 | 4 | 449 | 449 | 448 | 4484 |  | 727 | 728 | 293 | 730 | 730 | 7314 | 7321 | 73 | 7336 | 7343 |  |
|  | 2699 | 2693 | 2686 | 79 | 26 | 2666 | 2659 | 265 |  |  | 2.3038 | 3048 | 3057 | 306 | 3076 | 3086 | 309 | 310 | 3114 | 3124 |  |
| 5 | 087 |  |  |  |  |  |  |  |  |  |  | 8810 | 8822 | 8834 | 885 | 57 | 8869 | 8881 | 8893 |  |  |
|  | 90 | 9039 | 9029 | 9019 | 9009 | 8998 | 8988 | 8978 | 8968 | 4.8958 | $3 \cdot 4557$ | 4572 | 4586 | 4600 | 4614 | 4629 | 4643 | 4657 | 4671 | 4686 |  |
|  | 7224 | 721 | 7200 | 7188 | 7177 |  | 7153 |  |  | 571 | 4.0317 | 0334 | 0350 | 0367 | 0384 | 04 | 7 | 0433 | 0450 |  |  |
|  | 539 | 5385 | 5372 | 5358 | 5345 | 5331 | 5318 |  |  | $6 \cdot 5278$ | $4 \cdot 6077$ | 609 | 61 | 6134 |  | 6172 | 61 | 6210 | 6229 | 6248 |  |
|  | 357 |  |  | 3528 | 35 | 3498 | 348 |  | 3452 | 343 |  |  | 1879 |  | 1922 | 1943 | 196 | 198 | 2007 | 2029 |  |
| 10 | 1748 | 1731 | 1714 | 1698 | 1681 | 64 | 44 | 631 | 1614 | ． 159 | 57596 | 7619 | 7643 | 766 | 7691 | 7715 | 7738 | 776 | 778 | 81 | 10 |
| 11 | 992 | 99 | 9886 | 9867 | 9849 | 9831 | 9812 | 9794 | 977 |  | 6.3355 | 3381 | 3408 | 3434 | 3460 | 3486 |  |  |  |  |  |
| 12 | 809 |  |  | 析 |  | 1 |  |  |  |  | 6.9115 | 9143 | 9172 |  | 9229 | 9257 | 9286 | 9314 | 9343 | 937 | 2 |
| 13 | 627 | 6251 | 6229 | 6207 | 61 | 6163 | 6142 | 20 | 6098 | 10.607 | 874 | 49 | 493 | 49 | 49 | 5029 | 5060 | 509 | 5121 | 515 | 3 |
| 14 | 4447 | 4424 | 4400 | 4377 | 43 |  |  |  | 4259 | 10 | 34 | 066 |  | 07 |  | 0800 | 0834 | 086 | 0900 | 0933 |  |
| 15 | 26 |  |  |  |  |  | 2471 |  | 1 | 12. |  |  | 6465 |  |  | 6572 |  | 6643 | 6679 | 6714 | 15 |
| 16 | 07 | 0770 | 0743 | 0716 | 0690 | 0663 | 0636 | 0609 | 0582 | 13.055 | 9.2153 | 191 | 2229 | 226 | 2305 | 2343 | 2381 | 2419 | 2457 | 2495 | 16 |
| 17 | 8972 | 89 | 8915 |  | 88 | 882 |  | 8772 |  |  | 9.7913 |  | 799 | 803 |  | 8115 |  | 819 | 8236 | 827 | 7 |
| 18 | 714 |  |  |  |  |  |  | 6935 | 69 | 14.687 | $10 \cdot 36$ | 3715 | 3758 | 3801 | 38 | 3886 | 3929 | 39 | 4014 | 4057 | 18 |
| 18 | 5321 | 528 | 52 | 5226 | 51 | 5162 | 5130 |  | 506 |  | 10.94 | 947 | 95 | 95 | 963 | 9658 | 9703 | 97 | 914 | 9838 | 19 |
| 20 | 3496 | 3463 | 3420 | 339 | 336 | 33 | 3295 | 261 | 22 | 16.3194 | 11.5191 | 523 | 528 | 533 | 538 | 5429 | 547 | 55 | 5572 | 5619 | 20 |
| 21 | 167 | 1636 | 1600 |  |  |  |  |  |  | $17 \cdot 135$ |  |  |  |  |  |  |  |  |  |  |  |
| 22 | 9846 |  |  |  |  |  |  |  |  |  | 12. |  |  |  |  |  |  |  |  |  | 22 |
| 23 | 802 | 79 | 7943 | 7905 | 7866 | 78 |  | 7750 | 77 | 18 | $13^{\prime} 2$ | 252 | 257 | 26 | 2689 | 2743 | 2798 | 28 | 2907 | 2962 | 23 |
| 24 | 6195 | 6155 |  |  |  |  |  |  | 58 | 19.58 | 13.8 | 8287 | 83 |  | 8458 | 8515 | 8572 | 8629 | 8686 | 8743 | 24 |
| 25 | 4370 | 4328 | 4286 | 4244 | 4202 | 416 | 4118 | 076 | 4034 | 20.3992 | 14 | 40 | 410 | 4168 | 4227 | 428 | 4346 | 440 | 4464 | 452 | $\underline{25}$ |
| 26 | 25 | 2501 | 2458 | 2414 | 2370 | 2327 | 2283 | 2239 | 2196 | $21 \cdot 2152$ | 14 | 9811 | 98 | 99 | 9996 | －058 | 0120 | 0181 | 0243 | 0305 | 26 |
| 27 | 07 | 0674 | 0629 | 0584 | 053 | 0493 |  | 0403 | 035 | 22.03 | 15 |  | 56 | 57 | 5765 | 5829 |  | 59 |  |  | 27 |
| 28 | 889 |  |  |  |  |  |  |  | 8519 | $22 \cdot 847$ | 16 |  | 1401 | 1468 | 1534 | 1601 | 1667 | 1734 | 180 | 86 | 28 |
| 29 | 706 | 70 | 6972 | 6923 | 68 | 68 | 67 | 6729 |  | $23 \cdot 663$ | 16 | 709 | 71 | 7234 | 7303 | 7372 | 744 | 75 | 7579 |  | 29 |
| 30 | 5246 | 5194 | 43 | 5093 | 5043 | 499 | 42 | 4892 | 4841 | 24.4791 | $17 \cdot 2787$ | 2858 | 2930 | 3001 | 3072 | 3144 | 3215 | 3286 | 3357 | 3429 | 30 |
| 31 | 341 | 3367 | 3315 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 15 | 1510 | 1486 |  |  |  |  |  | 116 | 26.11 | 18 |  |  | 45 |  | 46 |  | 48 |  |  | 32 |
| 33 | 976 | 9713 | 9658 | 9602 | 9547 | 949 | 9436 | 9381 | 9325 | $26 \cdot 927$ | 19.00 |  |  |  | 0380 | 045 | 05 | 061 | 0693 | 077 | 33 |
| 34 |  |  |  |  |  |  |  |  | 7487 | $27 \cdot 743$ | 19 |  |  | 6068 | 6149 | 6229 |  | 639 | 647 | 655 | 34 |
| 35 | 611 | 605 |  |  |  | 5825 | 766 | 5707 |  | 28.55 | 20.1585 | 16 | 175 | 1835 | 191 | 200 | 2084 | 216 | 225 | 233 | 35 |
| 36 | 429 | 4233 | 4172 | 4112 | 405 | 399 | 3930 | 3870 | 3810 | 29.3749 | $20 \cdot 7344$ | 7430 | 751 | 7601 | 7687 | 7772 | 785 | 7943 | 3029 | 811 | 36 |
| 37 | 2468 | 2406 | 2344 | 2282 |  |  |  |  | 197. | 30\％ |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 06 | 0579 | 051 | 045 |  |  | 0260 |  | 0132 | 31.006 | 21.88 |  |  |  |  |  |  |  |  |  | 38 |
| 39 | 88 | 8752 | 868 |  |  |  | 8425 |  | 829 | $31 \cdot 822$ | 22.4623 | 471 |  | 4901 | 499 | 508 |  | 527 |  | 545 | 39 |
| 40 | 6992 | 25 | 6858 | 6791 | 6724 | 6657 | 6589 | 6522 | 6455 | 32.6388 | 23.0383 | 0478 | 0573 | 0668 | 0763 | 0858 | 0953 | 1048 | 1143 | 1238 | 40 |
| 41 | 51 | 5098 |  |  |  |  |  |  |  |  | 23.61 |  |  |  |  |  |  |  |  |  | 4 |
| 42 | 33 | 327 | 32 |  |  |  |  | 284 | 277 | 34.27 | 24 |  |  | 2201 |  | 24 | 2501 |  |  | 280 | 42 |
| 43 | 15 | 1444 | 1372 |  | 1228 |  |  | 1011 |  | $35 \cdot 08$ | 24 |  |  |  | 8070 | 817 | 827 | 83 | 8479 | 858 | 43 |
| 44 | 969 | 9618 | 9544 | 9470 |  | 936 | 248 | 174 | 910 | 35.902 | 25 |  | 363 | 373 |  |  | 404 | 415 | 425 | 436 | 44 |
| 45 | 786 |  |  |  | 75 | 748 | 13 | 138 |  | 36 | 25 | 928 | 939 | 950 | 960 | 9715 | 882 |  | ． 03 | 014 | 45 |
| 46 | 60 | 5964 |  | 5810 |  |  |  |  |  | 37.534 | 20 |  |  |  | 5377 |  |  |  |  |  | 46 |
| 47 | 4216 |  | 4058 | 3979 |  |  |  |  |  | 38.35 |  |  |  |  | 1147 | 1258 |  |  |  |  | 47 |
| 48 | 238 | 2310 | 2230 | 2149 | 20 |  | 1907 | 182 | 174 | 39．16 |  | 65 |  | 68 | 991 |  | 71 | 72 |  |  | 48 |
| 49 | 05 | 0483 |  | 0319 | 02 |  |  |  |  | $39 \cdot 9$ | 28.22 | 23 | 24 |  | 268 | 2801 |  | 303 | 3150 |  | 48 |
| 50 | 8740 | 8656 | 8572 | 8489 | 8405 | 8321 | 8237 | 8153 | 8069 | $40 \cdot 7985$ | 28 | 8097 | 8216 | 8335 | 8454 | 8573 | 869 | 8810 | 8929 | 2048 | 50 |
|  | 6915 |  |  | 6658 | 657 |  |  | 6316 | 6230 | 41.61 | 29•373 | 385 |  |  |  |  |  |  |  |  | 51 |
| 52 | 50 | 500 | 49 | 482 | 474 | 46 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 52 |
| 53 | 32 | 3176 | 30 | 298 |  |  |  | 2642 |  | 43.246 | 30.5 |  |  |  | 5761 | 58 | 60 | 61 | 6265 | 639 |  |
| 54 | 143 | 1349 | 1258 | 1168 | 107 |  | 0896 | 0805 |  | 44.0 |  |  | 127 | 140 | 1530 | 165 | 17 | 19 | 2043 | 21 | 54 |
| 55 | 961 | 95 |  |  | 9245 |  |  |  |  | 44.8 | 31. |  |  |  |  |  |  |  |  |  | 55 |
| 56 | 7789 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 |  |  |  |  |  |  |  |  | 5198 | $46 \cdot 5103$ | 3 |  |  |  | 8837 |  |  | 244 |  |  |  |
| 58 | 41 | 40 | 3944 | 38 | 37 | 3652 | 3555 | 3457 | 336 | 47.326 | 33 | 41 | 43 | 44 | 46 | 4744 | 4882 | 50 |  |  |  |
| 59 |  | 2214 |  |  |  |  |  |  | 1521 | 48.142 |  |  |  |  |  | 0516 | 065 | 0796 | 0936 | 107 |  |
| 60 | 0488 | 0388 | 0287 | 0186 | ＋08 | 9985 | 9884 | 9783 | 9683 | 48.9 | 34．5574 | 5717 | 5859 | 6002 | 6145 | 6287 | 643 | 6572 | 6715 | 685 | 50 |
| 61 | 8663 | 8561 |  |  | 825 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 61 |
| 62 | 683 | 67 | 6630 | 65 | 642 | 818 | 6214 |  |  | 50.59 |  |  |  |  |  |  |  |  |  |  |  |
| 63 |  |  |  |  |  |  | 78 |  | 4 | － 40 |  |  |  |  |  |  |  | 3901 |  |  |  |
| 64 | 318 | 3080 | 297 |  | 27 |  | 43 | 24 | 2328 | 52. | 36.86 | 87 | 89 | 906 | 922 | 937 | 95 | 967 | 9829 | 998 | 64 |
| 65 | 13 | 1253 |  |  |  |  |  |  |  | 53 | 37 | 45 |  |  |  |  |  | 5453 | 5607 | 576 | 65 |
| 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 58 | 577 | 56 | 55 | 54 |  | 5202 | 5088 | 497 | 55.485 | 39.16 | 18 | 197 | 21 | 229 |  |  |  |  |  |  |
| 69 | 406 | 3946 |  |  |  |  |  |  |  | 56.301 |  |  | 7738 |  |  |  |  |  | 3722 |  |  |
| 70 | 223 | 2119 | 2001 | 1884 | 1767 | 1649 | 32 | 14 | 129 | $57 \cdot 117$ | $40 \cdot 317$ | 333 | 350 | 366 | 383 | 400 | 41 | 433 | 450 | 46 | 70 |
| 71 | 041 |  |  |  |  |  |  | 9577 |  |  | 40 | 90 |  | 94 | 960 |  |  | ， | 0279 |  |  |
| 72 | 85 | 8465 | 834 | 822 | 83 |  | 786 |  |  | 58.74 | 41.4 |  |  |  | 537 | 551 | S |  |  | 62 | 72 |
| 73 |  | 析 | 6516 |  |  | 614 | 26 |  |  | 56 | $42^{\circ} 04$ |  |  | 左 | 114 | 1316 | 148 | 166 | 183 |  |  |
| 74 | 4935 | 4811 | 4687 | 456 | 443 | 4315 | 4190 | 406 | 394 | 60．381 | 42.62 | 63 | 65 | 67 | 69 | 708 | 72 | 7439 | 7615 | 779 | 74 |
| 75 | 3110 | 29 | 28 | 2733 | 2607 | 2481 | 2355 | 2229 |  | 61．1977 | $43 \cdot 196$ | 214 | 2324 |  | 268 |  |  |  |  | 357 | 75 |
| 76 | 128 | 1158 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9460 | 9331 | 9202 |  |  | 8814 | 8685 |  |  | $62 \cdot 82$ | 44 | 3670 | 3853 | 4036 | 4219 | 4402 | 45 | 4768 | 4950 | 513 | 77 |
| 78 | 763 | 75 | 73 | 72 | 7111 | 6980 | 684 | 671 | 65 | 63.6456 | 44.924 | 9432 | 9617 | 980 | 998 | －17 | 03 | 0544 | 0729 | 091 | 78 |
| 79 |  |  |  |  | 硅 |  | 14 |  | 4749 |  | $45 \cdot 5006$ | 咗 | ， | 556 | 575 | 1716 | ， | 6320 |  |  |  |
| 80 | 3984 | 3850 | 3716 | 3582 | 3448 | 3313 | 3179 | 3044 | 2910 | 65． 277 | $46 \cdot 076$ | 095 | 1146 | 133 | 152 | 171 | 190 | 2096 | 228 | 247 | 80 |
| 81 | 2159 | 2023 | 188 | 1752 | 1616 | 88 | 344 | 1208 | 107 | 66.0935 | $46 \cdot 65$ | 6718 | 6910 | 7103 | 729 | 748 | 768 | 7872 | 806 |  | 81 |
| 8 | 0334 | 0196 | ＋059 | 9921 | 9784 | 9646 | 9508 | 937 | 9233 | 66.90 | $47 \cdot 22$ | 2480 | 267 | 286 | 析 | 25 | 4 | 析 |  |  |  |
|  | 8508 | 8369 | 8230 | 8 |  |  | 7673 |  | 7394 |  |  | 82 | 843 | 6， | 88 | － | 922 | 942 | 9622 | 98 |  |
| 84 | 66 | 6543 | 64 | 626 | 6120 | 5979 | 5838 | 569 | 55 | $68 \cdot 5414$ | 48．380 | 400 | 4203 | 4403 | 460 | 480 | 500 | 520 | 5400 |  | 84 |
| 85 | 4858 | 4716 | 4573 | 4431 |  | 4145 | 4003 |  | 3717 |  | 489563 | 9765 | 9967 | －170 | 371 |  | 0775 |  |  |  | 85 |
| 86 | 3033 | 2889 |  |  |  |  |  |  |  |  |  |  |  |  |  | 析 | 6549 |  | 6958 |  |  |
|  | 1208 | 1062 | 0916 | 0770 | A | 0478 | 332 | 186 | －040 | 70.989 | 50．10 | 1289 | 1496 | 170 | 1910 | 211 | 23 | 25 |  |  |  |
|  | 93 | 92 | 9088 | 8940 | 872 | 45 | 8497 | 8349 | 8201 | 71.805 | 50．684 | 705 | 726 | 747 | 7679 | 788 | 8097 | 矿 | 8515 |  |  |
| 89 | 537 | 4， | 725 |  | 960 |  | 662 |  | 202 | 位 |  | 2813 | 2025 | 仡 | 3448 | 3659 | 387 | 408 | 4293 | 450 |  |
| 90 | 5732 | 5581 | 5430 | 5279 | 5128 | 4977 | 4826 | 675 | 452 | 73.4373 | 51.836 | 8575 | 8789 | 900 | 921 | 9431 | 964 | 9858 | －072 | 028 | 90 |
|  | 3907 | 37 | 3602 | 3449 | 3297 | 3144 | 2991 | 283 | 268 | 253 | 52．412 | 43 | 45 | 477 | 4986 | 529 | 541 | 5634 |  |  |  |
|  | 802 | 1928 | 171 |  |  | 寿 | 1156 | 1001 | 84 | 069 | 52.9880 | ＋093 | 0318 | 053 | 0755 | 097 | 119 | 141 | ， | 848 | 92 |
| 93 | 025 | －1 | 994 | 97 | 9633 | 9477 | 9320 | 9164 | 900 | 75.885 | $53 \cdot 56$ | 586 | 6082 | 630 | 6524 | 674 | 696 | 718 | 74 | 76 |  |
| 94 | 843 | 8274 | 8116 | 7959 | 7801 | 7643 | 85 | 7327 | 7169 | 76.701 | 54 | 16 | 1846 | 2070 | 229 | 251 | 274 | 296 | 寿 | 迷 | 94 |
| 95 | 6606 | 6447 |  |  |  |  |  |  |  | 77517 |  |  |  | 7837 | 8062 | 8288 | 851 | 8739 | 8965 | 919 | 95 |
| 96 | 4781 | 4620 | 4459 | 4298 | 413 |  |  |  | 3492 | 783331 | 55 |  | 3375 |  | 3831 | 4059 | 4287 | 451 | 4743 | 497 | 96 |
|  | 22 | 279 | 263 | 24 | 2305 | 2142 | 197 | 1816 | 165 | $79 \cdot 1490$ | $55 \cdot 867$ | 890 | 913 | 937 | 9600 | 9831 | －061 | 0292 | 0522 | 075 |  |
|  | 1130 | 0966 | 0802 |  | 2473 | 95 | －144 | 9919 | 815 | 79.9650 | 56.4438 | 4671 | 4904 | 5137 |  | 5602 | 5835 | ， | 630 | 5 31 | 98 |
|  |  | 9139 | 8973 | 8807 |  | 75 |  | 143 | 797 | $80 \cdot 7810$ | 57.019 | 0433 | 06 | 090 | 1139 | 1374 | 160 | 184 | 207 | 231 | 99 |
| 100 | 7480 | 7313 | 7145 | 6977 | 6809 | 6642 | 6474 | 6306 | 6138 | 81．5970 | $57 \cdot 5957$ | 6195 | 6432 | 6670 | 6908 | 7145 | 7383 | 7620 | 85 | 8095 | 100 |
|  | $50^{\prime}$ | T 4 ！${ }^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | 46 | 45 | 4 | 4，3＇ | 42＇ | $41^{\prime}$ |  | $49^{\prime}$ |  |  | $46^{\prime}$ | ｜ $45^{\prime}$｜ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.

| $35^{\circ}$ |  |  |  |  | Cosine. |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $35^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\overline{20}$ | $21^{1}$ | $22^{\prime}$ | $2{ }^{\prime}$ | $24^{1}$ | $25^{5}$ | $26^{\prime}$ | $27^{7}$ | 28 | 29 | 20 |  | , | $2{ }^{23}$ | $24^{+}$ | $25^{\prime}$ | 26 | 27 |  |  |  |
|  | 8158 | 8156 | 8155 | 815 | 8151 | 8150 | 81 | 814 | 8 | . 814 | 5783 | 5786 | 5788 | 5790 | 5793 | 5795 | 5798 | 5800 | 5802 |  |  |
|  | 63 | 6313 |  |  | 630 |  |  | 6292 |  |  | $1 \cdot 1567$ | 157 | 1576 | 15 | 1586 | 159 | 578 |  |  |  |  |
|  | 447 | 44 | 446 | 4459 | 4454 | 4449 | 4444 | 4439 | 4434 |  |  | 735 |  | 7371 |  | 13 | 7393 | 740 | 7407 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3162 |  |  |  |  |  |  |  |
|  |  |  |  |  | 0756 | 0748 |  |  |  | 4.0 |  |  |  |  | 8964 | 8976 |  |  | 9011 |  |  |
|  | 8948 | 8938 | 8928 | 8918 | 8908 | 8898 | 8887 | 8877 | ${ }^{8867}$ | 48 | 3'4700 | 4714 | 4728 | 4743 | 4757 | 4771 | 4785 | 4800 | 4814 | 482 |  |
|  | 7106 |  | 7083 |  |  |  | 703 |  |  |  |  | 0500 | 051 | 0533 | 0550 | 0566 | 0583 | 0599 | 0616 |  |  |
|  | 5264 | 52 | 5237 | 5224 | 5210 | 5197 | 5183 | 5170 | 5156 | 6.5143 | $4 \cdot 6267$ | 6286 | 63 | 6324 | d | 636 | 6380 | 63 | 6418 |  |  |
|  | 242 | 34 | 3392 | 3377 | 3362 | 3346 | 3331 | 3316 | 330 |  | $5 \cdot 2050$ | 2071 | 2093 | 2114 | 2135 | 2157 | 2178 | 2199 | 2221 |  |  |
| 10 | 1580 | 1563 | 1546 | 1530 | 1513 | 1496 | 1479 | 1462 | 1445 | 81428 | 57833 | 857 | 788 | 7904 | 792 | 7952 | 7976 | 7999 | 23 |  |  |
| 11 | 9738 | 9720 | 1970 | 1968 | 9664 | 9646 | ${ }^{9627}$ | 9608 | 959 | 8.957 | 6.3617 | 3643 | 366 | 36 | 372 | 3747 | 3773 | 3799 |  |  |  |
| 12 | 7896 | 78 | 7856 | 7836 | 78 | 77 | 7775 | 7755 | 7734. | 9.771 | $6 \cdot 9400$ | 9428 | 9457 | 948 | 9514 | 95 | 957 | 9 |  |  |  |
| 13 | 60 |  | 60 |  |  | 59 | 5923 | 5901 | 5879 | 10.5857 | $7 \cdot 5183$ | 5214 | 5245 | 527 | 530 | 533 | 5368 |  |  |  | 3 |
|  | 42 | 41 | 41 | 4 | 4118 | 4094 | 4071 | 4047 | 4023 |  |  |  | 1033 | 1066 |  | 113 | 1166 | 1199 | 1232 | 126 | 14 |
| 15 | 237 | 2345 |  |  |  | 2244 | 2219 | 2193 |  | 12.2 | 8.6750 | 6785 | 6821 | 6857 |  |  | 6963 | 6999 |  |  |  |
| 16 | 05 |  |  | 0447 |  | 0393 | 0366 | 0340 | 0313 | 13.028 | 9.253 |  |  |  |  |  |  |  |  |  | 16 |
| 17 | 684 | 6814 | 6784 |  |  | 6693 | 6562 | 6632 | 6602 |  |  |  |  |  |  |  | 4356 |  |  |  | 7 |
| 18 | ${ }^{6844}$ | 6814 | 6784 | 6753 | 6723 | 6693 | 6662 | 6632 | 6602 | 14.6571 | 10.4100 | 4143 | 418 | 42 | 4271 | 4313 | 4356 | 4399 | 4461 |  | 18 |
| 19 | 500 | 49 | 4938 | 4906 | 4874 | 4842 | 4810 | 4778 | 4746 | 15.4714 | 10.9883 | 9228 | 9973 | -018 | 00 | 0108 | 54 | 199 | 24 |  | 19 |
| 20 | 3160 | 312 | 308 | 3059 | 3026 | 2992 | 2958 | 2924 | 289 | 16.2857 | 11.5666 | 514 | 576 | 580 | 5856 | 590 | 595 | 5998 | 6046 |  | 20 |
| 21 | 1318 | 1283 | 1248 | 1212 | 1177 | 1141 | 1106 | 1071 | 1035 | 17.1000 | ${ }_{12 \cdot 1450}$ | 1500 | 154 | 159 | 16 | 1699 | 1749 | 1798 |  |  | 21 |
| 22 | 947 | 94 | 94 | 9365 | 9328 | 929 | 92 | 9217 | 180 | $17 \cdot 91$ | 12.7233 | 7285 | 733 | 73 |  | 74 |  | 88 |  |  |  |
| 2 | 76 |  | 75 | 7518 | 7479 | 74 |  | 7363 | 7324 | 18 | 13. | 3071 | 312 | 318 | 32 | 32 | 3344 | 339 | 3453 |  | 23 |
|  |  |  | 5712 | 5671 | 5631 | 55 |  | 5509 | 5469 |  |  | 8857 |  | 897 |  |  |  | 919 |  |  | 24 |
| 25 | 395 | 39 | 3866 | 3824 | 3782 | 3740 | 3698 | 3656 | 3613 | 20 |  | 464 |  | 47 | 4820 | 4880 | 4939 | 4998 |  |  |  |
|  | 21 |  |  |  |  | 18 | 18 |  | 1758 | 21 | $15^{\circ} 0366$ | 042 |  |  |  |  |  | 0798 |  |  | 26 |
|  | 0266 | 02 | 21 | 0130 | 0085 | -0 |  | 9948 |  |  |  | 6214 | 627 | 631 | 6406 | 647 | 6534 |  |  |  |  |
| 28 | 85 | 83 | 83 | 8283 | 8236 | 8189 | 8141 | 94 | 8047 | 22.8 | $16 \cdot 1933$ |  | 2066 | 2132 | 2199 | 2265 | 2331 | 2398 |  |  | ${ }^{28}$ |
| 29 | 65 | 65 |  | 36 |  |  |  |  | 6191 |  |  | 7785 | 7854 | 7923 | 7992 | 8060 | 8129 |  |  |  | 9 |
| 30 | 47 |  |  |  | 4538 | 4488 | 44 | 4387 | 433 | $24 \cdot 4285$ | 17.3500 | 357 | 3642 | 371 | 3784 | 385 | 392 | 399 | 4 |  | 30 |
| 31 | 2898 | 28 | 2794 | 2742 | 2690 | ${ }^{2637}$ | 258 | 2533 | 248 | $25 \cdot 2428$ | $17 \cdot 9283$ | 935 | 943 | 950 |  | 96 | 197 |  |  |  | 31 |
| 32 | 1056 | 10 | 09 | 0895 | 0841 | 07 | 0733 |  |  | $26^{\circ} \cdot 5$ | 18.50 | 5142 | 52 |  |  | 541 | 55 | 55 |  |  |  |
| 3 | 92 | 91 | 1 | 90 |  | 89 | 8881 | 88 | 87 | $26 \cdot 87$ | 19 | 0928 | 10 |  | 1163 | 12 | 1319 | 13 | 1476 |  | 33 |
| 34 | 73 | 73 | 7258 | 7201 | 7143 |  |  |  | 69 | 27 |  | 6714 | 67 |  |  |  |  |  |  |  | 34 |
| 35 | 553 | 54 | 541 | 535 | 52 | 5236 | 5177 | 5118 |  | $28 \cdot 5$ | 20 | 249 | 258 |  |  | 2831 | 2914 |  |  |  |  |
|  | 36 |  |  |  |  | 3385 | 33 | 326 | 13 | $29 \cdot 3$ | 20 |  |  |  |  |  |  |  |  |  | ${ }^{36}$ |
|  | 18 |  | 1722 |  |  |  | 14 | 141 | 134 |  | 21 | 40 | 415 |  | 34 | 442 | 450 |  |  |  |  |
| 38 | +00 | 99 |  |  | 9749 |  |  | 9556 |  |  | 21 | 985 | 9947 | -037 | 0127 | 0217 | 0307 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 6012 | 6105 |  |  |  |  |
| 40 |  | 6253 |  | 6119 |  |  | 5916 | 5849 | 5781 | 32.57 | 23.1333 | 1428 | 1523 | 161 | 171 | 180 | 190 | 1997 | 2092 |  | 40 |
| 41 | 4479 | 4410 | ${ }^{4341}$ | 42 | 4202 |  | 4064 | 3995 | 39 | ${ }^{33 \cdot 38}$ | 23.7116 | 7214 | 731 | 74 | 750 | 760 | 77 |  |  |  | 41 |
|  | 26 | 25 |  | 2424 | 2354 | 2283 | 2212 | 2141 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 07 | 07 |  | 0577 | 0505 | 0432 | 0360 |  | 02 | $35^{\circ}$ | $24 \cdot 8$ | 878 | 88 |  |  | 91 | 929 | 939 |  |  | 3 |
|  | 89 | 98 |  | 873 |  | 85 | 8508 | 8434 | 835 | 35 | 25. | 457 | 467 | 47 | 48 | 498 | 5092 | 519 |  |  | 4 |
| 45 | 711 | 7035 |  |  |  | 67 | 66 | 6580 | 65 | 36. |  | 03 | 04 | 057 | 0677 | 078 | 0890 | 099 |  |  | 45 |
|  | 52 |  |  | 5036 |  | 48 | 48 | 4726 | ${ }^{4648}$ | 37.45 | 26.6 |  | 62 |  |  |  |  |  |  |  |  |
| 47 | 34 | 15 | 3268 |  | 31 | 30 |  | 28 | 279 | 38.2 | 27 | 19 |  |  |  | 2374 | 24 |  |  |  |  |
| 48 | 15 | 15 |  |  |  | 11 | 10 |  |  |  |  |  |  |  | 8055 | 8169 | 8283 | 8396 | 8510 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4196 |  |  | 49 |
| 50 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4217 | 4 |  |  | 386 |  |  | 3603 | 3516 |  | 30 | 0856 |  |  |  | 135 | 147 |  |  |  |  |
| 53 | 237 | 22 | 219 | 21 | 2018 | 1928 | 1839 | 1750 |  | 43.15 | 30 | 60 | 67 | 6 |  |  |  | 738 | \% |  | 3 |
| 54 |  |  |  |  |  | $\bigcirc$ | 9987 | 1996 | 9805 | 43.971 | 31.22 | 24 | 255 | 26 | 281 |  |  | 319 |  |  | 4 |
| 55 | 869 | 8598 | 850 | 84 | 8320 | 8228 | 8135 | 8042 | 7949 | 44.785 | 31.8083 | 8213 | 834 | 8474 | 86 | 873 | 886 |  | 912 |  | 55 |
|  | 684 | 6754 | 6660 | 6566 | 6472 | 6377 | 6283 | 6188 | 6094 | $45 \cdot 59$ | 32 | 399 | 41 | 42 |  |  |  | 4796 |  |  |  |
|  | 501 | 4911 | 4815 | 47 | 4623 | 4527 | 44 | 4335 | 4238 | $46^{4} \cdot 41$ | 32 | 978 |  |  |  |  |  | 095 | 073 |  |  |
|  |  |  |  | 28 | 277 |  | 2579 | 2481 | 23 |  |  |  |  |  |  | 61 | 625 | 63 | 653 |  | 58 |
| 59 | 13 |  |  |  |  |  |  |  |  |  |  | 13 |  |  |  | 1 | 2056 | 2195 | 233 |  |  |
| 60 |  |  |  | 9178 |  | 89 | 8874 |  |  | 碞 |  |  | 7284 |  |  |  | 7853 |  | 8138 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 32 |  |  | 3651 |  | 3940 |  | 61 |
| 62 | 597 | 56 | 37 | 54 | 5379 351 | 3275 | 3318 | 32 | 4361 | 50.48, | 35 | 8713 | 886 |  |  | 930 | 944 | 959 | 97t |  |  |
|  | 395 | 38 | 37 | ${ }^{36}$ | ${ }^{3531}$ | 3424 | 3318 | ${ }^{3212}$ | 3106 | S2 |  | 4499 | 464 | 47 | 494 | S09 | 52 | 539 | 55 |  | 63 |
| 64 | 211 | 20 | , |  |  | 1574 | 1466 |  | 12s | 52.1142 | 37 | 0285 | 043 | 05 | 07 | O8 | 104 | 11 | 1347 |  | 5 |
| 65 | 027 | 0161 | .052 | 9943 | 9833 | 97 | 9614 | 9504 | 9395 | 52.9285 | 37.5916 | 6070 | 622 | 63 | 653 | 668 | 6841 | 699 | 714 |  | 65 |
|  | 8429 | 8318 | ${ }^{8207}$ | 8096 | 7984 | 7873 | 7762 | 7651 | 753 | 53.742 | 38.16 | 18 | 20 |  |  |  | 263 | 2795 | 251 |  |  |
|  |  | 64 | 63 | 62 | 6136 | 60 | 59 | 5397 | 568 | 54.551 | 38.74 | 764 | 780 |  | 81 |  | 843 | 859 | 875 |  |  |
|  | 47 | 46 | 45 |  | 4287 | 4172 | 4058 | 3943 | 3828 | 55-37 | 39'32 | 342 | 358 |  |  |  | 4234 | 435 | 45 |  | 68 |
| 69 | 29 | 27 |  |  | 2 | 2322 |  |  | 19 |  |  |  |  |  |  |  |  |  |  |  | 69 |
| 70 | 10 |  |  |  | 0589 | 0472 |  | 0235 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 71 |  |  |  |  |  | 86 |  | 8382 | 8262 | 57-814 | $41^{\circ} 06$ | 0784 | 095 |  | 1290 | 145 | 1626 | 179 | 189 |  | 71 |
|  |  | 72 | 71 | 7013 | 68 | 年 | 601 | 65 | 6406 |  |  | 6s |  |  |  |  |  | \% | 776 |  | 72 |
| 73 | 553 | 54 |  |  | 50 | 4920 | 4797 | 4674 | 4551 | 59 | 42 | 23 | 2529 | 2702 | 2875 |  | 3221 | 3394 | 3567 |  | 73 |
|  | 563 |  |  |  |  |  |  |  |  |  |  | 81 | 83 | ${ }^{2}$ | 8668 | 88 | d | 9194 |  |  | 74 |
| 75 | 1851 | 1725 | 1599 | 14 | 1346 | 1219 | 1093 | 0967 | 84 | 61.0713 | 43.374 | 392 | 410 | 428 | 446 | 46 | 481 | 4994 | 517 | 5350 | 75 |
| 76 | +009 | 98 | ${ }^{7753}$ | 9625 | 948 | 9369 | 9241 | 9113 | 8984 | 61.88 | $43^{\circ} 95$ | 9713 | 983 | P03 | 0254 | 04 | 06 |  | O |  |  |
|  | 816 | 801 | 7908 | 593 | T | 7519 | 7369 | 725 | 727 | 62.89 | 44 | 549 | 568 | 5864 | 6047 | 6229 | $64 / 2$ | 6594 | 677 |  |  |
|  | 632 | 61 | 60 | 59 | 5800 | 5668 | 55 | 54 | 5273 | 63.51 | $45^{\circ}$ | 1284 | 146 | 165 | 18 | 202 |  |  | 25 | 27 | 78 |
| 79 | 448 | 4 | 4217 | 40 |  | 38 | 1832 |  |  |  |  |  |  |  |  |  | 80 |  | 83 |  | 79 |
|  | 264 |  | 2372 |  |  | 1967 | 1832 | 1698 | 156 | 65. |  | 2856 | 3046 | 323 | 3425 | 3615 | 3804 | 3994 | 418 |  | 80 |
| 81 |  |  |  | , | 02 | 1 |  |  | 970 | 65.95 |  |  |  | 922 | 921 |  |  |  |  |  |  |
|  | 895 | 88 | 8681 | 85 | 84 | ${ }^{8267}$ | 8128 | 79 | 785 | $66 \cdot 77$ | 4742 | 4427 | 462 | 481 | 501 |  |  | 5594 | 57 |  |  |
| 84 | 71 |  |  |  |  |  |  |  |  | 67.5888 |  | ${ }_{5} 213$ | 0410 | 060 | -880 |  | 1 | 139 | 1590 | 178 | 83 |
| 85 | 443 | 3288 | 31 | 3002 | 285 | 2715 | 2572 | 2429 | 2285 | 69.2142 | 49.1582 | 1784 | 1986 | 218 | 238 | 259 | 279 | 2993 | 319 | 339 | ${ }^{84}$ |
| 86 | 158 | 146 | 130 |  |  | 0865 |  | 0575 | 0430 | $70^{\circ}$ | 4973 | 7570 | 7774 | 7978 | 8182 | 8386 | 85 | 879 | 895 |  | 86 |
|  | 974 | 96 | 9454 |  | 9161 |  | 8868 | 8721 | 8574 |  | 50 | 3356 | 3562 | 3768 | 3975 | 4181 | 438 | 4593 | 4799 |  |  |
| 88 | , | 7757 |  | 7461 | 31 |  | 1 | 6867 | 6719 | 71.6570 | 50.8932 | 9141 | 9350 | 95 | 976 | 99 | -18 | 0393 | 0602 |  | 88 |
| 90 | 606 | 5913 | 5764 3918 | 3767 | 3615 | 15314 | 3312 | 316 | 4863 <br> 3008 | ${ }_{73}^{72.4713}$ | 51.4716 52.049 | 4927 |  | 1140 | 5560 1353 | 577 |  |  | ${ }^{6404}$ |  | 89 |
| 90 | 42 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 178 |  |  |  |  |
| 91 | 23 | 22 | 2073 | 1920 | 1766 | 16 | 14 | 1306 | 1152 |  | 52.28 | 649 |  |  |  |  |  |  |  |  |  |
|  | 0537 | 038 | 02 |  | 9918 | 9763 | 9607 | 9452 | 9297 | 74.914 | 53.206 | 228 | 250 | 272 | 293 | 31 | 337 |  | 3811 |  |  |
|  |  |  | 85 |  |  | 7912 | 7755 |  | ${ }^{746}$ | 75 | 53 |  |  | 851 | 873 | 895 |  |  |  |  |  |
| 94 95 | 581 | 18651 | ${ }_{4}^{6537}$ | 4531 | ${ }_{4371} 62$ | 4211 | 4051 | 3891 | 5786 |  |  | ${ }^{386}$ |  |  |  |  | 07 |  |  |  |  |
|  | 31 | 3008 | 28 |  |  | 23 | 2199 | ${ }^{2037}$ |  |  |  |  | 5655 | 588 | 611 | 633 | 65 | 67 | 702 |  | 96 |
|  |  | 1164 |  | 08 | 0674 | 0511 | 0347 | 0183 | .02 |  |  | 1213 | 241 | 1673 |  | 2133 | 23 | 259 |  |  |  |
|  | 943 | 9320 | 731 |  |  |  |  |  | 8164 |  | 57.25 |  |  |  |  |  |  | 8392 | 8627 |  |  |
| 100 | 5801 | 5633 | 5465 | 5296 | 5128 | 4959 | 4791 | 4622 | 4453 | 80.6142 81.4284 | 57.2549 57.832 | 8570 | 8807 | 9044 | 9281 | 9518 | 9755 | 9992 | ${ }^{229}$ | 4666 |  |
|  | $40^{\circ}$ | 39 | $38^{\prime}$ | $37^{\prime}$ | $36^{\prime}$ | $33^{\prime}$ | 34 | $33^{\prime}$ | $32^{\prime}$ | $31^{\prime}$ | $40^{\circ}$ | $138^{\prime}$ |  | 37 | $36^{\prime}$ | $35^{\prime}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.

|  | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $35^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\prime}$ | $41^{1}$ | $42^{\prime}$ | 43 | $4{ }^{1}$ | $45^{\prime}$ | 46 | 47 | 48' | 49 | $40^{\prime}$ | $41^{\prime}$ | 42' | 43 | $44^{\prime}$ | 45 | $46^{\prime}$ | 47' | 48 |  |  |
|  | 312 | 8123 | 8121 | 8119 | 817 | 811 | 8114 | 81 | 8171 | 8109 | 5831 | 5833 | 5835 | 5838 | 5840 | 5842 | 5845 | 5847 | 5850 |  |  |
|  | 6248 | 6245 | 6242 | 623 | 623 |  |  | 62 |  | $1 \cdot 621$ | $1 \cdot 1661$ | 16 | 1671 | 1676 | 168 |  |  |  |  |  |  |
|  | 373 | 4368 | 4363 | 4357 | 435 | 4347 | 4342 | 4337 | 4332 |  | 1749 |  | 7506 | 75 |  |  | 7535 |  | 754 |  |  |
|  | 2497 | 249 | 2483 | 2477 | 247 | 2347 | 242 | 24 | 2443 |  | $2 \cdot 332$ | 3332 |  |  |  | 3370 | 3379 |  | 3398 |  |  |
|  | 50621 | 061 |  | 059 | 0587 | 0579 | 0570 | 0562 | 0553 | 4.05 | 2.9153 | 9165 | 9177 | 9189 | 9201 | 9212 | 9224 | 9236 |  | 9260 |  |
|  | 68745 | 873 | 8725 | 87 | 87 | 86 | 8684 | 8674 | 8664 | 4.86 | 3.498 | 499 |  |  | 50, | 505 | 5069 | 5083 | 5097 | 51, |  |
|  |  | ${ }^{6858}$ | 4967 | 6834 | 4940 | 4926 |  | 6786 |  |  |  | 0831 | 0848 | 0864 | 0881 | 0897 | 0914 | 093 | 6797 | 0964 |  |
|  | 4118 | 4980 3103 | 4967 | 4953 | 4940 | 4926 | 4912 | 4899 | 4885 | 6.4871 | 4.6645 | 6664 | 66 | 6702 | ${ }^{6721}$ | 6740 | 6759 | 677 | 6797 |  |  |
|  | 3118 | 3103 | 3088 | 3072 | 30 | 3042 | 3026 | 30 | 2996 | 7.2980 | $5 \cdot 2476$ | 24 | 2519 | 2540 | 2561 | 2582 | 2604 | 5 | 264 |  |  |
|  | 124 | 1225 | 1208 | 1191 | 1174 | 118 | 126 | 123 | 110 | 8.1089 | 5.8307 | 8331 | 8354 | 8378 | 8401 | 8425 | 9 | 8472 | 8496 |  | 0 |
| 11 | 9367 | 19348 | ${ }^{9329}$ | 9311 | ${ }^{9292}$ | ${ }^{9273}$ | 9254 | 7236 | ${ }^{921}$ | 8.9198 <br> 18307 | 6.4138 | 4164 | 41 | 4216 | 424 | ${ }^{4267}$ | 93 | 431 | 4345 |  | 1 |
|  | 7491 | 7470 | 7450 | 7630 | 7409 | 73 | 7368 | 7348 | 732 | 9.7307 | 6.9968 | 999 | -025 | 0053 | 0082 | 0110 | 0138 | 167 | 0195 |  | 2 |
|  | 5615 | 559 | 5571 | 55 | 55 | 5505 | 54 | 5460 | 5438 | 10.5416 | 7.5799 | 5830 | 5860 | 5891 | 5922 | 5952 | 5983 | 6014 | 604 |  | 3 |
| 14 |  | 371 |  | 36 | 3644 | 3620 |  | 3573 | 354 | 11 | $8 \cdot 163$ | 1663 | 169 | 172 | 176 | 179 | 182 | 186 | 1894 |  | 4 |
| 15 | 5.1863 | 183 | 813 | 1787 | 1762 | 1736 | 1711 | 1685 | 1660 | 12.1634 | 87460 | 7496 | 75 | 75 | 7602 | 7637 | 767 | 770 | 774 | 777 | 5 |
|  | 679988 | 9961 | 9933 | 9906 | 9879 | 98 |  |  |  | 12 | 9.3291 |  |  |  | 3442 |  |  |  |  |  |  |
|  | 78112 | 80 | 8054 | 802 | 7996 | 79 | 79 | 79 | 7881 | 13.7 |  | 9162 | 920 | 92 |  |  | 936 |  | 9443 |  | 17 |
| 18 | 88236 | 6206 |  | 6144 | 6114 |  |  | 6022 |  | 14.5 | 10.49 | 499 | 503 |  | 5122 | 516 | 5207 | 525 | 5292 | 533 | 18 |
|  | 4360 | 4328 | 4296 | 4264 | 4231 | 4199 | 4167 | 4134 | 4102 |  | 11.078 | 0828 | 0873 | 09 | 0963 | 1007 | 1052 | 109 | 1142 |  | 9 |
| 20 | 02485 | 2451 |  | 238 | 2349 | 2315 | 2281 |  | 2213 | 16.2179 | 11.6614 | 6661 | 6708 | 6755 | 6803 | 6850 | 6897 | 6944 |  |  | 2 |
| 21 | 060 | 057 | 0538 | 0502 | 0466 | 0431 | 0395 | 359 | 0323 | 17.028 | $12 \cdot 2444$ | 2494 | 2544 | 259 | 2643 | 2692 | ${ }^{2742}$ | 2792 | 284 |  | 21 |
| 22 | 28733 | 8696 | 8658 | 8621 | 8584 | 8546 | 8509 | 8471 | 8434 | 178397 | 12'827 | 832 | 83 | 84 | 8483 | 8535 | 8587 | 8639 | 869 |  | 2 |
| 23 | 685 | 6818 | 6779 | 6740 | 6701 | 6662 | 66 | 6584 | 6545 | 18.6506 | 13.4106 | 4160 | 4214 | 4269 | 4323 | 437 | 4432 | 4486 | 454 |  | 3 |
|  | 4981 | 49 | 190 | 4859 | 4819 | 4778 | 4737 | 4696 | 4655 | 19.4614 | 13.9 | 9993 | -050 | 0107 | 0163 | 0220 | -277 | 0333 | 039 | 04 | 24 |
| 25 | 3106 | 3063 | 3021 | 2978 | 2936 | 2894 | 2851 | 2808 | 276 | $20 \cdot 27$ | 14:576 | 5826 | 588 | 5944 | 6003 | 60 | 612 | 6180 | 6239 |  | 25 |
| 26 | 12 | 1186 |  | 1098 | 1053 | 1009 | 09 | 921 | 0877 | 21.083 | 15.15 | 165 | 172 | 17 |  |  |  |  |  |  |  |
|  |  | 93 |  | 9217 | 9171 | 9125 | 90 | 9033 | 8987 | $21 \cdot 88$ | 15.74 | 749 | 7556 | 762 |  |  |  | 787 | 7939 |  |  |
|  | 747 | 74 | 7383 | 73 | 7288 | 72 | 7193 | 7145 | 7098 | 22 |  | 33 | 3392 | 3458 | 24 | 359 | 3656 | 3722 | 3788 |  | 28 |
| 29 |  |  |  | 5455 |  |  |  |  |  |  |  | 9158 |  |  |  | 9432 | 9501 |  | 9638 |  |  |
| 30 | 372 | 3676 |  |  |  | 3472 |  |  |  |  |  |  |  |  |  |  |  | 5417 |  |  | 30 |
| 31 | 18 |  |  |  |  |  | 153. | 1483 |  | $25 \cdot 13$ | 18.075 | 0825 | 08 | 0971 | 1044 | 1117 | 1191 | 1264 | 133 | 1410 | 31 |
| 32 |  |  |  | 98 | 9758 | 97 | 778 | 9595 | 7st |  | 18.6582 | 6658 | 6733 | 68 | 68 |  | 7035 | 711 |  |  | 32 |
| 33 | 8100 | 804 | 7988 | 7932 | 7875 | 78 | 77 | 77 | 76 | 26.75 | 19.2413 | 24 | 2569 | 2647 |  |  |  | 58 |  |  | 33 |
| 3 |  | 61 |  | 605 | 59 | 59 |  | 5820 |  | 27. 5704 |  | 8324 | 8404 | 8484 |  |  |  |  | 8886 |  | 34 |
| 35 | 43 | 428 | 4229 | 4170 | 41 | 40 | 3991 | 393 | 3872 | $28 \cdot 3813$ | 20 | 4157 | 423 | 432 | 440 | 448 | 457 | 465 | 473 | 4818 | 35 |
| 36 | 247 | 24 | 23 | 228 | 2228 | 21 | 2105 | 2044 | 1983 | 29.19 | 20.95 | 9990 | +075 | 016 | 02 |  |  |  |  |  |  |
|  |  | 05 |  |  | 03 | 0 | 025 | 0157 | 0094 | 30.00 | 21.57 | 5823 | 5910 | 59 |  |  |  | 6347 | 643 |  |  |
| 38 |  | 86 | 859 | 8527 | 84 | 8398 | 83 | 8269 | 820 | 30 |  | 1656 | 1746 | 183 | 19 | 20 | 2105 | 219 |  |  | 38 |
| 40 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 496 | 490 |  |  |  |  | 4562 |  |  |  |  |  |  |  |  |  |  |  |  |  | 40 |
| 41 |  |  | 295 | 28 | 28 | 2745 | 2676 |  | 25 |  |  |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 23 | 129 |  | 1 | 09 | 897 | 898 | 0718 | 8757 |  |  | 4988 |  |  |  |  |  |  |  |  | 42 |
| 4 |  |  |  | 912 | 90 | 897 |  | 8831 | 8757 |  |  | 08 |  | 1024 |  |  | 1329 |  |  |  | 43 |
| 44 | 55 | 5514 | 5438 |  | 5285 | 52 | 5132 | 5055 | 4979 | ${ }_{36} \mathbf{4} 4902$ | 26.238 | ${ }_{2487}^{654}$ | 25 | $\begin{aligned} & 686 \\ & 2700 \end{aligned}$ | $\begin{array}{r} 6860 \\ 280606 \end{array}$ | 2912 | 3010 | 1125 | 3231 |  | 45 |
|  | 3715 | 3636 | 3558 | 3480 | 3402 | 3324 | 3246 | 3168 | 3089 | 37-301 | $26^{\text {82 }}$ | 8320 | 8429 | 8538 |  | 875 |  |  | 908 |  |  |
|  |  | 17 | 1679 | 15 | 1520 | 1440 | 1360 | 12 | 1200 | 38.1120 |  | 4153 | 4264 | 43 |  |  | 08 | 4819 |  |  | 47 |
| 48 | 9963 | 98 |  | 971 | 963 | 9556 | 9474 | 9392 | 9311 | 38.9229 | $27 \cdot 98$ | 9986 | 1100 | 0213 | 032 | 04 | 0553 |  | d |  | 48 |
|  |  |  |  |  | 775 | 76 |  | 75 | 7421 |  |  | 5819 | 593 | 605 | 616 |  |  | 65 | 66 |  | 49 |
| 50 | 621 | 6127 | 604 | 5957 | 587 | 5787 | 5702 | 5617 | 5532 | $0^{\circ}$ | $29 \cdot 1$ | 1653 | 177 | 188 | 200 |  | 2243 | 23 | 243 |  |  |
|  |  |  |  | 4076 | 3989 | 3903 | 3816 | 37 | 3643 | 4 | 29.73 |  |  |  |  |  |  |  |  |  |  |
|  | 248 | 23 | 228 | 219 | 2107 | 201 | 19 | 1842 | 1753 | 42. |  | 3319 | 344 | 356 |  | 381 |  | 405 | 4178 |  | 52 |
| 53 | 0584 | 049 | 040 |  |  | 013 | 1044 | 9954 | 9864 |  |  | 9152 | 927 | 940 | 957 | 965 | 977 |  | .028 |  | 53 |
| 54 |  | 8617 |  | 84 | 8342 | 825 | 815 | 8066 |  |  |  |  |  |  |  |  |  |  |  |  | 54 |
| 55 | 683 | 67 | 6646 | 65 | 64 | 6366 | 6272 | 6179 | 6085 | 44.5991 | 32.0688 | 0818 | 0948 | 1078 | 120 | 133 | 1467 | 159 | 172 | 1856 | 55 |
| 5 | 4957 | 4862 | 4767 | 4672 | 4577 | 4481 | 4386 | 4291 | 4196 | 45.4100 | 32.6518 | 6651 | 6783 | 6915 | 7048 | 718 | 731 | 744 | 757 | 7708 | 56 |
| 57 | 3081 | 298 | 28 | 279 | 2694 | 259 | 2500 | 2403 | 2306 | 46.2209 | 33 | 2484 | 2618 | 2753 | 2888 | 502 | 3157 |  | 3426 |  |  |
| 58 | 1205 | 1107 | 1008 | 0910 | 0811 | 0713 | 0614 | 0516 | 0417 | 47.0318 | 3 | 8317 | 8454 | 859 | 828 | 88 |  | 9139 |  |  | 58 |
| 59 |  | 92 |  | 9029 | 8929 | 889 | 8728 | 8628 | 8528 | 47.8427 | 34 | 4150 | 4288 | 4429 | 456 | 47 | 4847 | 4986 | 51 |  | 59 |
| 60 | 7454 | 7352 | 7250 | 7148 | 7046 | 6944 | 6842 | 6740 | 6638 | 48.6536 | 34 | 998 | -12 | 0266 | 04 | 05 | 0691 | 0833 | 0975 |  | 60 |
|  | 5578 | 5474 | 5371 | 5267 | 5164 | 5060 | 4956 | 4853 | 4749 | 49:464 | $35 \cdot 5$ | 5816 |  | 6104 | 624 |  |  |  | 6824 |  |  |
|  |  | 359 | 343 | 338 | 3281 | 3176 | 307 | 29 | 2860 | 50.2754 | 36.15 | 1649 | 1796 | 1942 | 20 | 22 |  |  | 4 |  | 62 |
| 63 |  | 17 | 161 | 1506 | 138 | 12 | 118 | 1077 | 0970 |  |  | 7482 | 7631 |  |  | 807 | 82 | 8375 | 8523 |  | 63 |
| 64 | 99 | 98 |  |  |  |  |  |  |  |  |  |  |  | 36 |  |  |  |  |  |  | 54 |
| 65 | 807 | 796 | 78 | 77 | 76 | 7523 | 7413 | 7302 | 7191 | 52.7081 | 37.8995 | 9148 | 930 | 945 | 960 | 976 | 991 | .069 | 0223 |  | 65 |
| 66 | 6199 | 6087 | 5975 | 5863 | 5751 |  | 5527 | 5414 | 5302 | 53.5190 | $38^{\prime} 4825$ | 4981 | 5137 | 5293 | 5449 | 5605 | 5761 | 5916 | 6072 | 62 | 66 |
|  | 4323 | 421 | 40 | 398 | 3868 | 375 | 36 | 3527 | 3413 | 54.32 |  | 0814 | 0973 | 113 |  | 144 |  | 764 | 1922 |  | 67 |
| 66 | 24 | 233 | 22 | 210 | 1986 | 1870 | - | 1639 | 1523 | 55.1408 | $39 \cdot 6487$ | 6647 | 680 | 6969 | 7129 | 729 | 7450 | 7 | 712 |  | 68 |
|  |  |  |  |  | -103 | 9986 | 9869 | 9751 | 9634 | 55.9517 | $40 \cdot 2317$ | 2480 | 264 | 2806 | 29 | 31 | 3295 | 8 | 3621 |  | 69 |
| 70 | 8696 | 857 | 8458 | 8340 | 8221 | 8102 | 7983 | 864 | 7745 | 56.7626 | 40.8148 | $83 / 4$ | 8479 | 8644 | 8810 | 8975 | 9140 | 930 | 9470 | 96 | 70 |
| 71 72 | 16820 | 67 | 65 | 6459 | 6338 | 6218 | 6097 | 5976 | 5855 | 57.5734 | 41397 | 4147 | 4314 | 44 |  |  |  |  | 5320 |  |  |
| 72 | 494 | 482 | 470 | 457 | 4456 | 4333 | 4211 | 4088 | 3966 | 58.3843 | 41.9809 | 9980 | +150 | 0320 | 04 | 06 |  |  | 1170 | 133 | 72 |
| 73 |  | 294 | 282 | 26 | 25 | 243 | 23 | 22 | 207 | $59 \%$ | 42.56 | 581 | 59 | 61 | 63 | 650 | 6675 | 6847 |  | 71 | 73 |
| 75 | 41193 | 10 |  |  |  |  | 0439 |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{7}$ |
| 75 | 9317 | 919 |  |  |  |  | 8553 |  |  |  |  |  |  | 783 |  |  |  |  | 8718 |  | 㖪 |
| 76 | 74 | 7312 | 718 | 7054 | 69 | 67 | 6667 | 653 | 640 | 61.6279 | 44-3132 | 3312 | 349 | 367 | 3850 | 4030 | 4209 | 4388 | 4568 | 47 | 76 |
| 77 | 7556 | 5435 | 5304 | 51 | 5043 | 4912 | 4781 | 4650 | 4519 |  |  |  |  |  |  |  |  |  | 0477 |  | 77 |
| 78 | ${ }^{78} 8369$ | 13557 | 3425 <br> 1546 <br> 18 | 323 | 3160 | 1143 | 2895 | 276 | 2630 | ${ }_{63}^{63}$ | 45 |  | 516 | ${ }_{11846}^{536}$ | 553 | 5715 |  | $33$ | ${ }_{2117}^{6267}$ | ${ }_{2351}^{645}$ | 78 |
| 80 | 9938 | ${ }_{9803}$ | ${ }^{2667}$ | 9531 | 9395 | 9259 | 9123 | 8987 | 8851 | 64-8715 | ${ }^{46 \cdot 6455}$ | 6644 | 6833 | 7022 | 7211 | 740 | 7589 | 7777 | 7966 | 815 | 80 |
|  | 806 | 7925 | 7788 | 765 | 7513 | 7375 | 7237 | 709 | 6962 | 65*6824 | 47.2286 | 2477 | 266 | 28 | 3051 | 3262 | 3433 | 362 | 3816 |  | 81 |
|  | 618 | 6048 | 5908 | 57 | 5630 | 5491 | 5351 | 5212 | 5072 | 66•4933 | 47.8116 | 8310 | 8504 | 8697 | 889 | 98 | 9278 | 9472 | 9665 | 985 | 32 |
| 83 | 431 | 417 | 402 | 388 | 3747 | 36 | 34 | 3324 | 3183 | 67-3042 | $48^{\text {P3947 }}$ | 4143 | 4339 | 4535 | 4731 | 492 | 5123 | 5319 | 5515 | Sts | 83 |
| 84 | 4.243 |  |  |  | 18 | 172 | 157 | 1436 | 1294 | 68.115 | 48.9778 | 9976 | +17 | 037 | 057 | 077 |  | 116 | 1364 |  | 84 |
|  |  | 0415 | 0271 | ${ }_{127}$ | 9982 | 9838 | 9693 | 954 | 940 | 68'920 | $49 \cdot 5$ | 580 | 6010 | 621 |  |  | 6813 | 7013 |  |  |  |
|  | 868 | 85 | 6st | 82 | 8100 | 7954 | 7807 | 7661 | 7515 | 69.7368 | 50.1439 |  | 1845 | 2049 | 22 | 24 | 2658 |  |  |  |  |
|  |  | 66 | 65 | 6 | 6217 |  | 5921 | 5773 | 5626 | 70.5477 | 50.72 | 7475 | 768 | 7886 | 80 | 82 | 8503 | 8708 |  |  | 87 |
| 888 88 | 493 | 47 | ${ }_{2754}^{4633}$ | 44 | 4335 | 4185 |  |  |  |  |  |  |  |  |  | 41 | 434 |  |  |  | ${ }_{88}^{88}$ |
| 90 | 01181 | 2928 | 0875 | ${ }^{2672}$ | 2452 | 0417 | 0264 | -111 | 18957 | 72.980 | 52 | 497 | 5187 | 5400 | 561 | 5825 |  | 6250 | 6462 |  | 80 |
|  | 19305 | 9150 | 8996 | 88 | ${ }^{8687}$ | 8532 | 8378 | ${ }^{8223}$ | ${ }^{8068}$ | 73.7913 | 53.0593 | 0808 | 1022 | 1237 | 1452 | ${ }^{1667}$ | 1882 | 2097 | 2312 |  |  |
|  | 7423 | 72 | 52 | 50 | 688 | 6648 | 6492 | 6335 | 6179 | 75 | ${ }^{53} .6423$ | 6641 | 6858 | 7075 |  | 7510 |  | 7944 |  |  |  |
| 93 | 3555 | 53 | 52 | 50 | 492 | 4764 | 4606 | 4448 | 428 | 75 | 54.2254 | 2474 | 2693 | 2913 | 3133 | 335 | 3572 |  | 401 |  | 93 |
| 94 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 95 |  | 164 |  | 1318 | 1157 | 0995 | 83 | 67 | 051 |  |  | 140 | 4364 | 458 | 881 |  | 52 |  |  |  |  |
| ${ }_{9}^{96}$ | 992 | 976 | 960 | 943 | 927 | 91 | 8948 | 8785 | 862 | $77 \cdot 8458$ | 55:9746 |  |  | 04 | 06 | 08 | 1106 | 1333 | 1559 |  |  |
| 97 | 805 | 7886 | 772 | 755 | 739 | 7227 | 7062 | 6897 | 673 | 78.6567 | 56.5577 | 580 | 603 | 626 |  | 67 |  |  |  |  | 97 |
| 98 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8 |
|  | 90 ${ }_{2423}^{429}$ | 2253 | 84 | 1914 | 1744 | 1574 | 1404 | 1234 | 1064 | 80.2785 81.089 | 58.3069 | 3305 | 354 | 377 | 4014 | 4250 | 4886 | 4722 | 4958 | 5194 | 100 |
|  | $20^{\prime}$ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ | $13^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ |  |  | 54 | $17^{\prime}$ | 16 | $15^{\prime}$ | 14 | $13^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 35 | －Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $35^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 50 | 51］ | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $\frac{55}{18099}$ | $\frac{56^{\prime}}{18097}$ |  | $58^{\prime}$ | 59＇ | $50^{\prime}$ | 61＇${ }^{1}$ | ［ $52^{\prime}$ | 63＇1 | 54＇ | 65 |  |  | $58^{\prime}$ | 59 |  |
|  | 8107 | 8106 | $8104$ | 8102 | 8100 |  |  | 80 | 8094 | 80 | 585 | 57 | 859 | 5861 | 64 | 866 | 5868 | 5871 | 5873 | 875 |  |
|  | 62 | 6211 | 62 | 6204 | 6201 | 6197 | 6194 | 619 | 61 | $1 \cdot 618$ | ． 170 | 1713 | 1718 | 1723 | 1727 | 1732 | 173 | 1742 | 1746 |  |  |
|  | 432 | 4317 | 431 | 4306 | 4301 | 42 | 42 | 42 | 428 | 2.42 | 175 | 7570 | 75 | 75 | 7591 | 75 | 7605 | 7612 | 7619 | 7626 |  |
|  | 2429 | 2422 | 2415 | 2408 | 2402 | 2395 | 2388 | 238 | 2374 | 3.236 | 347 | 3427 | 3436 | 346 | 3455 | 3464 | 3474 | 348 | 349 | 3502 |  |
| 5 |  | 028 |  | 0511 | 0502 | 0494 | 0485 | 0476 | 046 | 045 | 2.9271 | 9283 | 9295 | 930 | 9319 | 9330 | 9342 | 935 | 9366 | 9377 |  |
| 6 | 8643 | 86 | 86 | 8613 |  |  |  |  |  | 4．855 | $3 \cdot 5126$ | 5140 | 51 | 5168 | 5182 | 96 | 5211 | 5225 | 5239 |  |  |
|  | 675 | 673 | 672 | 67 |  |  |  |  | 665 |  |  |  | 1013 |  | 1046 | 1063 | 1079 | 1096 | 1112 |  |  |
|  | 4858 | 4844 | 4831 | 4817 | 48 | 47 | 4776 | 4762 | 4749 | 6.473 | ＇833 | 68 | 68 | 6891 | 6910 | 6929 | 6947 | 696 | 6985 |  |  |
|  | 2965 |  |  |  | 2904 | 28 | 2873 | 2858 | 2842 | 7282 | 268 | 2710 | 27 | 2752 | 2774 | 2795 | 2816 | 2837 | 2858 | 2879 |  |
| 10 | 1072 | 1055 | 1038 | 1021 | 1004 | 0987 | 70 | 0953 | 0936 | 8.0919 |  | 8567 | 8590 | 14 | 8637 | 866 | 8684 | 870 | 873 | 8755 | 0 |
| 11 | 9180 | 916 | 91 | 9123 | 9105 | 9086 | 9067 | 9048 | 9029 | 8.9011 | 6． 4397 | 4423 | 4449 | 4475 | 4501 | 4527 | 4553 | 4579 | 4605 | 4630 | 1 |
| 12 | 72 | 72 |  |  | 7205 |  | 7164 | 714 |  |  |  | 02 |  |  | ， | 0393 | 04 | 0449 | 0478 |  | 2 |
| 13 | 539 | 537 | 5350 | 5328 | 5305 | 5283 | 5261 | 5239 | 5217 | 10.51 | $7 \cdot 610$ | 61 | 61 | 6198 | 6228 | 6259 | 62 | 6320 | 6351 | 638 | 3 |
| 14 | 35 | 34 | 345 | 3430 | 3406 | 33 | 335 | 3334 | 33 | 11 | 8.1960 | 19 | 20 | 2059 | 2092 | 21 | 21 | 2191 | 2224 | 225 | 14 |
| 15 | 18 |  |  |  |  |  | 14 |  | 位 | 12.137 | 8.7814 | 78 | 78 | 7921 | 7956 | 7991 | 3027 | 8062 | 3097 | 8132 | 15 |
| 16 | 97 | 9688 |  |  |  | 9579 |  | 9525 | 9497 |  |  |  |  |  |  | 3857 |  |  |  |  | 16 |
| 17 | 78 | 77 |  |  |  | 767 |  |  |  |  |  |  |  |  |  | 9723 | 9763 |  |  |  | 7 |
| 18 | 59 |  |  |  |  | 5777 | 5746 | 5715 |  | 14.5654 | 10 | 5420 | 546 | 55 | 55 | 558 | 56 | 56 | 5717 | 5759 | 18 |
| 19 | 403 | 400 | 3973 |  | 3908 |  | 3843 |  | 3778 | 15 | 11.12 | 1276 | 132 | 1366 | 141 | 1456 | 1500 | 1545 | 1590 | 163 | 9 |
| 20 | 2145 | 211 | 2077 | 204 | 2008 | 1974 | 1940 | 1906 | 1872 | $16 \cdot 183$ | 11.70 | 7133 | 7180 | 7227 | 727 | 732 | 36 | 746 | 463 | 75 | 2 |
| 21 | 0252 | 02 | 01 | 0145 | 01 | 0073 | 0037 | －001 | 9965 | 16．992 | 12 | 29 | 3039 | 3089 | 313 | 3188 | 3237 | 3287 | 3336 | 3385 |  |
|  | 83 |  |  |  |  | 8172 |  |  |  | 17.8021 | 12.8794 |  | 8898 |  | 9002 | 90 | 91 | 9157 |  |  | 22 |
| 23 | 646 | 642 | 63 | 63 | 6310 | 6270 | 6231 | 6192 | 6153 | 18.6113 | 13.4 |  | 47 | 4811 | 4866 | 492 | 497 | 5028 | 5082 | 513 | 23 |
| 24 | 45 |  |  |  |  |  | 4 | 4287 | 4246 | 19.42 | 14 |  | 0616 | 067 | 07 | 078 | 08 | 0899 |  |  | 24 |
| 25 |  |  |  |  |  |  |  |  |  |  | 14．6357 | 641 | 6475 | 553 | 6593 | 66 |  | 6770 |  |  | 25 |
| 26 | 078 | 07 | 0699 | 0655 | 0611 |  |  | 0478 |  | 21.0389 | 15.221 | 2273 | 233 |  | 2457 | 2518 | 2579 |  |  |  | 26 |
| 27 | 88 | 88 | 8803 | 875 | 8711 | 866 | 8619 | 857 |  |  |  | 81 | 8193 | 825 | 832 | 8384 |  |  | 8575 |  | 27 |
| 28 | 70 |  |  | 6859 | 12 |  |  |  | 6620 | 2 | 16 |  | 403 | 4118 | 418 | 42 |  | 4382 | 4448 | 551 | 28 |
| 29 | 511 | 50 | 5011 | 496 | 4912 | 4863 | 4813 | 476 | 4714 |  | 16.97 |  | 991 | 998 | －04 | 01 | 01 | 025 | 0321 | 038 | 29 |
| 30 | 32 | 3166 | 3115 | 3064 | 301 | 2961 | 2910 | 2859 | 2808 | 24 | 17.56 | 57 | 577 | 5841 | 591 | 598 | 60 | 61 | 619 | 626 | 30 |
| 31 | 1324 | 1271 | 1219 | 1166 | 1113 | 106 | 1007 |  | 090 | 25.084 | $18^{\circ} 1483$ | 1556 | 1629 | 1702 | 1775 | 1848 | 1921 | 1994 | 2067 |  |  |
| 32 | 943 | 93 |  | 9268 |  |  |  |  |  |  | 18.7337 | 7413 |  |  | 7639 | 7715 | 790 |  |  |  |  |
| 33 | 753 | 74 | 7426 | 7370 | 1314 | 7257 | 7201 | 7145 | 708 | 26.70 | 19.3 | 32 | 3347 | 342 | 35 | 35 | 3658 | 3736 | 3814 | 389 | 33 |
|  | 56 |  |  | 5472 |  |  | 52 |  | 5182 | $27 \cdot 51$ | 19 | 91 | 92 |  | 93 | 94 |  | 9607 | 987 | 767 |  |
| 35 | 375 |  |  | 3574 |  |  |  |  |  |  |  |  | 06 |  | 5230 |  |  | 5478 | 556 | 64 | 35 |
| 36 | 186 | 179 | 1738 | 1676 | 1615 | 1554 | 1492 | 1431 | 1369 | 29．1308 | 21.075 | 0839 | 092 | 1000 | 1094 |  | 1264 | 1348 |  |  | 36 |
| 37 | 99 | 99 | 9842 | 9779 | 971 |  |  |  |  |  |  |  |  | 687 |  |  |  |  |  |  | 37 |
| 38 | 807 | 801 | 7945 | 7881 | 781 | 7751 |  | 76 | 7556 | 30.74 | 22.2463 |  |  |  | 2822 |  |  |  |  |  | 38 |
| 39 | 618 | 611 | 6049 | 5983 |  | 5850 | 5783 | 571 | 5650 | $31 \cdot 5583$ | 22 | 84 | 850 | 8593 | 86 | 87 | 8869 | 8961 | 9053 | 14 | 39 |
| 40 | 428 | 422 | 53 | 4085 | 4017 | 3948 | 38 | 3812 | 37 | 32．367 | $23 \cdot 41$ | 426 | 436 | 445 | 45 | 46 | 473 | 48 | 492 | 502 | 40 |
| 41 | 2397 | 2327 | 2257 | 2187 | 2117 |  |  |  |  | $33 \cdot 17$ | 24.00 |  | 219 | 0316 |  |  |  |  |  |  |  |
| 42 | 050 | －4 | 0361 |  | 021 | O1 |  |  |  | 33.98 | 24.58 |  |  |  |  |  |  | 6573 |  |  |  |
| 43 | 86 | 8538 | 8465 | 8391 | 8318 | 8245 | 81 |  | 8024 | 34.79 | 25.1735 | 1836 | 1937 | 203 | 2140 |  | 2343 | 2444 | 2545 |  | 43 |
| 45 | 671 |  |  | 93 |  |  |  |  | 6118 | $35 \cdot 604$ |  | 7693 | 7796 |  |  | 8108 | 8211 | 3315 | 418 | 52 |  |
| 45 | 482 | 47 | 4672 |  |  |  |  |  | 42 |  | $26 \cdot 34$ | 3549 | 365 | 3762 | 38 | 39 | 4080 | 4186 | 4292 | 439 | 45 |
| 46 | 293 | 285 |  |  |  |  |  |  |  |  |  |  | 95 |  |  |  |  |  |  |  |  |
| 47 | 10 |  |  |  |  |  |  |  |  |  |  |  |  | 54 |  |  |  |  | 6038 |  | 47 |
| 48 | 91 | 90 | 8984 | 8902 | 8820 | 8738 | 8656 | 8574 | 8492 | 38.8410 | 28.10 | T1 | 123 | 134 | 14 | 15 |  |  | 191 | 202 | 48 |
| 49 | 72 |  |  |  |  |  |  |  |  |  |  | 69 | 709 | 720 |  |  |  |  | 778 |  |  |
| 50 | 53 | 5277 | 5191 | 5106 | 5021 | 4936 | 4850 | 4765 | 4679 | 40.4594 | 29 | 283 | 2951 | 30 | 31 | 33 | 3422 | 3540 | 3657 | 377 | 50 |
| 51 | 3469 | 338 | 3295 |  | 3121 | 303 | 2947 |  |  | 41＇268 | 29.85 | 868 | 810 | 893 |  |  |  |  |  |  |  |
| 52 | 157 | 148 | 13 | 1310 | 1222 | 1133 | 104 |  | 08 | $42^{\circ} 07$ | 30．44 | 45 | 46 | 479 | 49 |  |  |  |  |  |  |
| 53 | 968 | 9593 | 95 | 9412 | 9322 | 9232 |  |  |  | 42.88 | 31.027 | 0403 | 052 | 065 | 077 |  |  | 115 | 27 |  |  |
| 5 | 7791 | 7699 | 7607 | 15 | 22 | 7330 |  |  | 7054 | $43 \cdot 69$ | $31 \cdot 61$ | 6259 | 6387 | 651 | 66 | 6768 | 6895 | 1 | 715 | 217 |  |
| 55 | 589 | 580 | 5710 | 5617 | 5523 | 542 |  |  | 51 | $44^{4} 50$ |  | 2116 | 224 | 237 | 25 |  | 2764 | 2893 | 3023 | 315 |  |
| 56 | 400 |  | 3814 | 3719 |  |  |  |  | 3241 |  |  |  | 105 | 8237 |  |  |  |  |  |  |  |
|  | 211 |  |  |  |  |  |  |  |  | 46.12 | 33 3695 |  |  | 409 |  |  |  |  |  |  |  |
| 58 | 022 | 01 | －022 | 9923 | 982 | 9725 | 962 |  | 9428 | 46 | $33 \cdot 9$ | 9686 | 982 | 995 | －096 | 02 | 03 | 05 |  | 077 |  |
| 59 | 832 | 82 |  | 8025 |  |  |  |  |  | 47 | 34.5 |  |  | 58 |  |  |  | 637 | 651 |  |  |
| 60 | 64 | 6332 | 6230 | 6127 | 6025 | 5923 | 5820 | 5718 | 5615 | 48 | $35 \cdot 1258$ | 1399 | 154 | 16 | 1823 | 1965 | 2106 | 224 | 238 | 253 | 60 |
| 61 | 454 |  |  |  |  |  |  |  |  | 49：360 |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 26 | 25 | 2437 | 2332 | 222 | 2120 | 2014 | 190 | 1802 | 50．16 | $36 \cdot 29$ |  | 32 |  |  |  |  |  |  |  |  |
| 63 |  |  |  |  | 03 |  |  |  |  | ．978 | 36 |  | 91 | 926 | 94 |  |  | 9860 |  |  |  |
| 64 | 886 | 875 |  |  | 8427 |  |  |  |  |  |  | 48 | 1 | 512 | 52 | 54 | 5 | 573 | 58 | （030 |  |
| 65 | 69 | 685 |  |  |  |  |  |  |  | 52.597 | 38 | 0682 | 083 |  |  | 5 | 1448 |  | 175 | 190 |  |
| 66 | 507 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 39.223 |  | 25s | 271 |  |  |  |  |  |  |  |
| 68 | 129 | 11 | 1060 | 0944 | 082 | 071 | 05 | 048 | 036 | 55.02 | 39.80 | 82 | 841 | 857 | 87 | 88 | 90 | 92 | 937 |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  | 427 | 443 | 45 |  | 4922 | 5085 | 524 |  |  |
| 70 | 750 | 7387 | 7268 | 7149 | 702 | 6910 | 679 | 6671 | 655 | 56.643 | $40 \cdot 980$ | 996 | 13 | 029 | 046 | 062 | 079 | 095 | 1120 | 128 | 70 |
| 71 | 5614 | 549 | 537 | 5251 | 513 | 500 |  |  |  |  | $4{ }^{\circ} 56$ |  |  |  |  |  | 6 |  |  |  |  |
| 72 | 372 | 359 | 34 | 3353 | 32 | 3107 | 298 |  | 273 | 58.26 | 42．15 | 16 | 18 | 2018 |  |  | 25 |  | 8740 | 303 |  |
| 73 | 182 |  |  |  |  |  |  |  |  |  |  | 7536 |  |  |  |  |  |  | 寿 |  |  |
| 74 | 993 | 98 | 968 | 95 | 9431 | 9305 | 917 | 9052 | 8926 | 59.879 | 43＇32 | 3392 | 3567 | 3741 | 39 | 40 | 42 | 44 | 461 | 478 |  |
| 75 | 80 | 7915 | 析 | 7659 | 7531 |  | 7275 | ， | 701 | $60 \cdot 689$ | 43．9072 | 9249 | 9426 | 9603 | 977 | 995 | ， | ¢ | 0486 |  | 75 |
| 76 | 615 |  |  | 57 | 5632 |  |  |  |  |  | 44.4 |  |  |  |  |  |  |  |  |  |  |
| 77 | 425 | 4126 | 3995 | 3863 | 173 | ， | 3469 |  | 320 | $62 \cdot 3075$ | ， | 09 | 114 | 位 | 150 | 16 | 1869 | 205 | 23 | 241 |  |
| 78 | 236 | 2231 | 209 | 19 | 18 | 1699 | 156 | 1433 | 130 | 63．116 | $45 \cdot 663$ | 6819 | 700 | 718 | 737 | 75 | 773 | 7922 | 810 | 82 |  |
|  | 0471 |  |  | 析 |  |  | 9663 |  | 析 |  | 46 | 2676 | 2862 | 184 | 323 |  | 析 |  | 㖪 | 416 |  |
| 80 | 8579 | 42 | 306 | 8170 | 8033 | 7897 | 7760 | 7624 | 7487 | 64735 | 46.834 | 8532 | 8721 | 890 | 909 | 928 | 947 | 966 | 985 | ${ }^{\circ}$ | 80 |
| 81 | 66 | 6548 | 6410 | 6272 | 6134 | 5996 | 5857 | 5719 | 558 |  | d | 438 | 458 | 477 | 49 | ， | 53 | 55 | 5725 | 591 |  |
| 82 | 47 |  | 4514 | 4374 | 4234 | 4094 | 3954 | 3814 | 3674 |  | 48.005 | 024 | 043 | 063 | d |  |  | 1405 |  |  |  |
| 83 | 290 | 215 | 26 | 247 | 2335 |  | 2051 |  | 析 |  |  | 195 | 629 | 643 | 665 | 681 |  | 7276 | 747 | 766 |  |
| 84 | 100 | 0865 | 07 | 0578 | 0435 | 0292 | 0148 | －005 | 986 | $67 \cdot 97$ | $49 \cdot 176$ | 195 | 215 | 235 | 25 | 27 | 29 | 3146 | 334 | 354 |  |
| 85 | 911 |  |  |  |  |  |  | 8100 |  | 68.7810 | 4976 | 81 | 8016 | 2， | 8417 | 86 | 8817 | 01 |  |  |  |
| 86 | 722 |  |  |  | 6 |  |  |  |  |  |  |  |  |  | 428 |  |  | d80 |  |  |  |
| 87 | 532 | 5181 | 5033 | 4885 | 4736 | 4588 | 4439 | 4291 | 4142 | 70．399 | 50.93 | 9529 | 9734 | 993 | 1144 | 0349 | 0 | 0759 |  |  |  |
| 88 | 3437 | 328 | 137 | 2987 | 2837 | 2686 | 2536 | 2386 | 2236 | $71 \cdot 2085$ | 5151 | 5385 | 5593 | 580 | 6008 | 621 | 642 | 663 | 883 | 704 |  |
| 8 | 1544 | 1392 | ， | 1089 | 0937 |  | 063 | 0481 | 0329 | 72.0177 | $52 \cdot 10$ | 1242 | 1452 | 1662 | 187 |  | 22 | 2500 | 2710 | 291 |  |
| 90 | 9651 | 9498 | 344 | 9191 | 9037 | 8884 | 8730 | 8577 | 8423 | 72＇8269 | 52．6886 | 709 | 7311 | 7523 | 773 | 794 | 815 | 837 | 858 | 879 | 90 |
| 91 | 77 |  |  | 72 | 713 | 6983 | 6827 | 672 | 6517 | $73 \cdot 636$ | 53.27 | 295 | 317 | 338 |  | 3813 | 4028 | 4242 |  |  |  |
| 92 | 5866 | 析 |  | 53 | 523 | 508 | 4924 | \％ | 4610 |  | 53.859 | 8812 | 902 | 24 | 9463 | 9670 | 989 | ， | ， | 54 |  |
| ， | 3973 | 3814 | 36 | 3497 | 3339 | 3180 | 302 | 2863 | 2704 | 25 | 54.44 | 466 | 488 | 510 | 5326 | 5545 | 5764 | 59 | 62 | 642 |  |
| 94 | 2080 | 1920 | 析 | 1599 | 1439 | 1279 | 1118 | 0958 | 0797 | 76.063 |  | 052 | 074 | 0968 | 119 | 1412 | 163 | 1854 | 207 | 227 | 94 |
| 95 | 0187 | －025 |  | 9702 |  | 9377 |  |  | 8981 | 76.872 | 15 |  |  | 683 |  | 721 | 75 | 772 | 7949 | 2172 | 95 |
| 96 | 8294 | 8131 | 7077 | 7804 | 7640 | 7476 | 73 | 48 | 6984 | 77620 | 56 | 23 | 246 | 269 | 2918 | 31 | 3370 | 3596 | 3822 | 4048 | 96 |
| 97 | 6402 | 6236 | 6071 | 5906 | 5740 | 5575 | 54 | 5244 | 5078 | 78.491 | 56.78 | 809 | 832 | 855 | 878 | 9010 | 9238 | 946 | 9695 | 992 |  |
| 98 | 450 | 43 | 4175 |  | 194 | 3674 | 109309 | 3339 | 3172 | 79.300 | 57.3721 | 395 | 4183 | 441 | 464 | 487 | 51 | 5337 | 5568 | 5799 | 98 |
|  | 2616 | 28 |  |  | 194 | 1772 | 160 | 1434 | 1265 | 80． 1096 | 57.9575 | 980 | －042 | 0275 | 05 | 07 | 097 | 1208 | 144 | 1674 | 99 |
| 100 | 0723 | 0553 | 0383 | 0212 | 042 | 9871 | 9700 | 9530 | 9359 | 80.918 | 58.5429 | 5665 | 5901 | 6137 | 6372 | 6608 | 684 | 07 | 31 | 7550 | 100 |
|  | $10^{\prime}$ | $\theta^{\prime}$ | $8^{\prime}$ | $7^{7}$ | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ | 1 ${ }^{\prime}$ | $12^{\prime}$ |  | $10^{\prime}$ |  |  | $17^{\prime}$ | $6^{\prime \prime}$ | $5^{\prime}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $36^{\circ} \quad$ Cosine |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{2}^{1}$ | ${ }^{807}$ |  | ${ }^{806}$ |  | ｜ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{3}{ }^{4} 8219$ | ${ }^{42126}$ | ${ }_{4}^{429}$ | 12 |  | 2 | ${ }^{42188}$ |  | 4178 | 2．473 |  | 7711 | 1718 | 1725 |  |  |  |  |  |  |  |
|  | ${ }_{5}^{4} 50365$ | ${ }_{035}^{2285}$ | ${ }^{2278}$ | ${ }_{0339}^{2272}$ |  |  |  |  |  |  |  |  | 362 | ${ }^{3634}$ |  |  |  |  |  |  |  |
|  | 68438 | ${ }^{8428}$ | 8418 | 8407 | 8397 | 8387 | ${ }^{8376}$ | ${ }^{8366}$ | ${ }^{8356}$ | $4 \cdot 83$ | 3.5408 | ${ }^{5422}$ | 5436 | 5450 | 5465 | 5479 | 5493 | 15507 | 1 |  |  |
|  |  |  |  |  | 646 |  |  |  |  |  | 4.131 | ${ }^{1326}$ | 1362 | 1359 | 725 | 1392 | 1408 |  |  |  |  |
|  | ， | 2642 | 526 | 261 |  | 2580 |  |  |  |  |  | ${ }_{3133} 723$ |  | ${ }^{2} 178$ | 1289 |  |  |  |  |  |  |
|  | 10 |  | 596 | 0679 | 2652 | 2654 |  | 061 |  | \％ |  |  | 9061 | 084 | 10 | 131 | ${ }_{3}^{235}$ |  |  |  |  |
|  |  | ${ }^{8785}$ | 8766 |  |  |  |  |  |  | ${ }^{88863}$ |  |  | 4967 | 4992 | 501 | 15044 |  |  |  |  |  |
| 13 | 13 | ${ }_{4927}$ |  | 4883 | ${ }_{4860}^{6794}$ | 483 |  |  | 4771 |  | ${ }_{7} 7.6718$ | $\left.\right\|_{6748} ^{0885}$ | － 877 | 6809 | 9840 | ${ }^{688}$ |  | $1{ }_{691} 1013$ |  |  |  |
|  | 14 | ${ }_{1070}^{2988}$ | 2974 | 2950 | 293 | 2902 | 2878 | 2854 |  |  |  | ${ }_{8556}^{2656}$ | 2885 | 2718 | 2751 | 278 | 28 |  |  |  |  |
|  | 9169 | 914 | 9116 |  |  |  |  |  | 894 | 12 | 9．4622 | 4459 | 4497 | ｜4334 | 14572 | 4610 | 4647 | 1685 |  |  |  |
|  |  | 721 | 7183 |  | 712 |  |  |  | 7008 |  |  |  |  |  |  | 0523 |  | 602 | 552 |  |  |
|  | 3388 | 335 | 3322 | 3290 | 32 |  |  |  |  |  |  | 2170 | ${ }_{21} 2$ | ${ }_{2260}$ | 238 | ${ }^{234}$ | 2393 | 2438 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 8074 |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{7598}$ |  |  |  |  |  |  |  |  | ${ }_{1}^{12 \cdot 352929}$ | $\begin{gathered} 3988 \\ \hline 9882 \end{gathered}$ | ${ }^{4027}$ | 4076 | $\begin{gathered} 4126 \\ \hline 129 \end{gathered}$ | 4775 | ${ }^{4224}$ | ${ }^{427}$ |  |  | 1 |
| $\left.\right\|_{23} ^{232}$ | 5685 | 5640 | 5501 | 5561 | 552 | 5482 | 5443 | 5443 | 5 4 |  | 13 | ${ }_{5785}^{982}$ | 5839 | 5893 |  |  |  | ${ }^{0} 109$ |  |  |  |
|  | ${ }^{24} 51827$ | 1783 | ${ }_{174}^{367}$ | $\left.\right\|_{1697} ^{3629}$ |  |  |  | ${ }_{155}^{364}$ | ${ }_{1482}^{3423}$ |  |  | ${ }_{7593}^{1689}$ | 1745 | ${ }_{7170}^{1802}$ | 1785 | 191 |  |  |  |  |  |
|  | \％ 6898 | ${ }^{\text {985 }}$ | ${ }^{8810}$ | ${ }^{9785}$ |  |  |  |  |  |  | 15 | 496 | 355 | 3519 | $\begin{aligned} & 3680 \\ & 9500 \end{aligned}$ | ${ }^{374}$ | 38 |  |  |  |  |
| 28 |  |  | 7879 |  |  |  |  |  |  |  |  | $\begin{aligned} & 9400 \\ & 5304 \end{aligned}$ |  |  | ${ }_{550} 959$ | 965 |  |  |  |  | 27 |
|  |  |  |  |  |  |  |  |  |  |  |  | ${ }_{1208}^{2504}$ |  | ${ }_{1344}^{5435}$ |  |  |  | 1616 |  |  | ${ }_{29}^{28}$ |
|  |  |  |  |  |  |  |  |  |  |  |  | 711 | 182 |  | 7323 |  | 7643 |  |  |  | 0 |
|  |  | ${ }_{8828}^{0211}$ | 0158 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 51 |  |  |  |
| 33 | 36410 | 6354 | 6297 | 6240 | 6183 | 6127 | 607 | 601 | 5956 |  |  | 4822 | 490 | 4977 | 5.45 | 5132 | 5210 | 5287 |  |  |  |
|  |  |  | 4367 |  |  |  |  |  | 016 |  |  |  |  |  |  |  |  |  |  |  |  |
| $\frac{35}{36}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 0568 | 0506 |  |  |  |  |  |  |  | $12449$ |  |  | $\begin{gathered} 27803 \end{gathered}$ | $8877$ | 2871 | 2956 | 3040 | ${ }^{3125}$ |  | ${ }^{36}$ |
| ${ }^{38}$ | 67 |  |  |  |  |  |  |  |  |  |  | 434 |  |  | 4609 |  | 4787 | 487 |  |  | 38 |
|  |  |  |  |  |  |  |  |  | 237 |  | ${ }^{23.6054}$ | 6148 | 226 |  | 2519 | 5524 | 6618 | 571 |  |  |  |
|  | 1099 |  | 0854 |  |  |  |  |  |  |  |  |  |  |  | 234 |  |  |  |  |  |  |
| 42 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5214 | 706 | 6993 | 9897 |  |  |  | 68 | 65 |  | ${ }_{2} 25$ | 3059 | ${ }^{396}$ | 406 | 416 | ${ }_{4283}^{427}$ | 436 | 44 |  |  | 43 |
|  |  |  |  |  |  | 290 |  |  |  |  | $26 \cdot 5561$ | 566 | 5773 | 587 |  |  |  |  |  |  |  |
|  |  | ${ }_{9352}^{1281}$ | ${ }_{9271}^{1202}$ | ${ }_{9191}^{1123}$ | ${ }^{1044} 9$ | ${ }_{\text {O29 }}^{0965}$ | ${ }_{\text {ckid }}^{088}$ | ${ }_{\text {8887 }}^{0880}$ | ${ }_{8786}^{027}$ | ${ }^{337.0648}$ |  | ${ }^{157}$ | lis9 | ${ }^{1787}$ |  |  | 110 | 13 |  |  |  |
| ${ }_{48}^{4}$ | ${ }_{8}^{8} 7806$ | 7323 | ${ }^{734}$ | 7258 |  | 7093 |  | ${ }_{6988}^{8887}$ | ${ }_{6}^{878}$ |  |  | ${ }_{3} 7474$ | 17895 | ${ }^{7693}$ | 371 | ${ }_{3829}^{7316}$ | ${ }^{1826}$ | ${ }^{8} 8136$ | ${ }_{4166}^{8246}$ |  | ${ }_{48}^{47}$ |
|  |  |  |  |  |  |  |  |  | 4905 |  |  |  |  | 9512 |  |  |  |  |  |  |  |
|  |  | ${ }^{1637}$ | 1550 | ${ }^{1462}$ |  | ${ }^{1287}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 699 |  |  |  |  |  |  |  |  |  |
| 54 | ${ }^{53} 5948$ |  | 15759 | ${ }_{5656}^{598}$ | 5573 | 5480 | ${ }_{538}^{738}$ | 1234 | 5201 | ${ }_{43}^{4} 3$ |  | ${ }_{880}^{289}$ | 302 | 9054 | 181 | 339 | － 3434 | ${ }^{3643}$ |  |  | S |
| 55 | 540017 | 393 | 3828 | 3734 | 363 | 5485 | 3450 | 55 |  |  | 32 | ${ }_{4704}^{880}$ | 883 |  | 181 | 52 |  | 5478 |  |  | 54 |
|  |  |  | 189 |  | 170 |  |  |  | 1320 |  |  | 10608 | 0739 | 087 | 1002 | 113 | 1265 | ${ }^{1336}$ | 1 |  |  |
| 57 | 578 01036 | ＋60 | 9967 | 8867 |  | 967 | 9575 | 7538 | ${ }_{7438}{ }^{379}$ |  |  | 6511 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 5904 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 3764 |  |  | 48.3 | 35.4082 | 423 | 4363 | 4504 |  | 478 | 492 | 5067 | 520 |  |  |
|  | ${ }^{2455}$ | ${ }^{235}$ | ${ }^{2246}$ | 2141 | ${ }^{203}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 8501 | ${ }_{8493} 04$ | ［335 | 827 | 8168 | 8960 | 7952 | 7843 | 7735 |  |  | ${ }_{1934}$ | ${ }^{2082}$ | ${ }_{222}^{632}$ | ${ }^{2377}$ |  | ${ }^{675}$ | ${ }_{282} 2$ |  |  | 淅 |
| 64 |  | dst | 645 |  | 635 |  | 6014 | 5904 | 5794 |  |  | 783 | 7988 | 813 |  | 843 | 858 |  |  |  | 64 |
| 65 |  |  |  |  | 430 | 18 | 077 |  |  | 52，374 |  |  |  |  |  |  | 號 |  |  |  |  |
|  |  | 270 | 259 | 2480 | 236 | ${ }^{223}$ | 2140 | 2026 | 13 |  | 889490 |  |  |  | 110 |  |  |  |  |  | 66 |
| $\|68\|$ | （0886 | 8850 | ${ }^{0833}$ | 0548 <br> 8616 | O433 | ${ }^{8382}$ | ${ }^{0} 2038$ | P087 | ${ }^{9972}$ |  | 39：5391 |  | 57 | 589 | ${ }^{6022}$ | 617 | ${ }^{633}$ | 64922 |  |  |  |
| 69 70 |  |  |  |  |  |  |  |  |  | 55：597 |  | ${ }_{7356}$ |  |  |  |  |  | ${ }_{8327}$ |  |  | ${ }_{69}$ |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3186 | 1306 | 1011 | 12820 | 26 |  |  | 2332 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 73 \\ & 74 \\ & 74 \end{aligned}$ | 9332 | 9206 | 9081 | 8956 | 8830 | 8705 | 8579 | 8453 | ${ }_{838}$ |  | 43.0799 | 097 | 1162 | 131 | 1485 | 1656 | 182 | 1998 | 2170 |  | 73 |
| 78 |  | ${ }_{5349}^{7278}$ | 72151 <br> 522 <br> 1 | ［023 | 496 | ${ }_{483}^{678}$ |  | ${ }_{4575}^{6514}$ | ${ }_{446}^{637}$ |  |  | 687 |  |  | 738 | 756 | $7743$ | 796 |  |  | 4 |
|  |  |  |  |  |  |  |  | 2636 | 2506 |  |  |  |  |  |  |  |  |  |  |  | 75 |
|  |  |  |  |  |  |  | 0330 |  | 056 |  |  |  |  |  |  |  |  | 5670 | 5850 |  | 77 |
| $\left.\begin{aligned} & 78 \\ & 79 \end{aligned} \right\rvert\,$ |  |  |  | 9295 |  |  |  | 875 | 862 |  |  |  |  |  | 103 | 1221 | 1404 | 1587 |  |  |  |
| 80 |  | ${ }^{7} 7734$ | ${ }_{5568}^{7498}$ |  | ${ }_{5293}^{7223}$ |  |  |  | 688 |  |  | 229 |  | ${ }^{676}$ |  | 7 7135 | ${ }_{3235}^{7320}$ |  |  |  |  |
|  | 391 |  | ${ }^{3638}$ | 3469 |  |  |  | 294 | 282 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 1426 |  | 1144 |  | 0861 |  |  | 4104 | 4297 | 4489 | 4582 | 487 |  |  |  |  | ${ }_{83}^{82}$ |
| ${ }_{84} 8$ | 48835 | 7991 | 7847 | 7702 |  | 7413 | 7269 | ${ }^{7} 124$ |  | ${ }^{60}$ |  |  |  |  |  | 670 |  |  |  |  | ${ }^{83} 8$ |
| 85 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{5}$ | 4 | 3386 | 13838 | ${ }^{3690}$ | 13622 | 133 |  | 1 |  |  |  |  |  |  | 523 | d |  |  |  |  |
|  |  |  | $\begin{aligned} & 2055 \\ & \hline 0,125 \\ & \hline \end{aligned}$ | $\begin{aligned} & 1906 \\ & 99974 \end{aligned}$ | 988 |  | 25 | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 89 |  |  |  |  |  |  |  | 7429 | 7276 |  |  | 543 | 5639 | 5848 | 6057 | 6266 | 6474 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 72.518 | ＋1122 |  |  |  |  | 2179 |  |  |  |  |  |
|  | 12646 | ${ }_{2562}^{4490}$ | ${ }^{43344}$ | ${ }^{2248}$ | ${ }_{\text {coicl }}^{\substack{4027 \\ 2087}}$ | 1929 | 171 |  |  |  |  | ${ }^{238}$ | 451 |  |  |  |  |  |  |  |  |
| 933 | 273 | 0633 | ${ }_{047}$ | ${ }_{031}^{23}$ | ${ }^{2} 153$ | 1993 | 9834 | ${ }_{9673}$ | 951 |  |  | ${ }^{314} 9$ | ${ }^{3263}$ | 948 | 9709 | ${ }^{40918}$ | ${ }_{126}^{422}$ | ${ }^{4} 4354$ | 4572 |  | 22 |
| 94 |  |  | 85 |  |  |  |  |  |  |  |  | 4949 | $\begin{aligned} & 2169 \\ & 5169 \end{aligned}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 6．54 |  |  | 107 |  |  |  |  |  |  |  |  |
|  | ${ }^{6} 75012$ | 4847 | ${ }_{288}^{688}$ | 451 | 4352 | 4187 | 4022 |  | 369 |  |  |  |  |  |  |  |  | 8108 |  |  |  |
|  | 8781158 | 2988 | ${ }^{2821}$ | 06 | 2484 | 2316 | 1 | 1977 | 1751 |  | 57．2432 | 2563 |  | 311 |  | 3570 | 3798 |  | 17 |  |  |
|  |  |  | －960 | 389 | ${ }^{36} 1$ | 8380 | 273 | 析 |  | 97 |  |  | 4700 |  |  | 3， |  |  |  |  |  |
|  |  |  | $4^{4}$ | $47^{\prime}$ | $16^{\circ}$ | $15^{5}$ | $144^{\prime}$ | ${ }^{43}$ | $12^{+}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 36 |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 20 | $21^{\prime}$ | 22 | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 | $28^{\prime}$ | $29^{\prime}$ | 20 | $21^{\prime}$ | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ |  |  |  |  |  |
|  | 8056 | 8054 | 8052 | 8051 | 8049 | 8047 | 8045 | 8044 | 8042 | 8040 | 925 | 5927 | 5930 | 5932 | 593 | 5937 | 5939 | 5941 | 5944 | 46 |  |
|  | 611 | 61 | 61 | 610 | 609 | 609 | 609 | 60 | 608 | 1.6 | $1 \cdot 1850$ | 1854 | 1859 | 1864 | 1868 | 析 | 1878 | 1882 | 崖 | 2 |  |
|  | 41 | 41 | 415 | 4152 | 4147 | 4142 | 4136 |  | 4126 | 2.412 | －7774 | 7781 | 77 | 7796 | 7803 | 7810 | 7817 | 7824 | 7831 | 7838 |  |
|  | 2223 | 2216 | 22 | 203 |  |  | 2182 | 2175 | 2168 | 3.21 |  | 370 | 3718 | 3727 | 373 | 374 | 3755 | 3765 | 3774 | 37 |  |
|  | 0279 | 271 | 0262 | 025 | 0245 | 0236 | 0227 | 219 | 0210 | 4.0 | 2．9624 | 963 | 9648 | 9659 | 967 | 968 | 96 | 970 | 9718 | 9729 |  |
|  | 8335 | 8325 | 83 | 83 | 829 | 82 | 8273 | 63 | 8252 | 4.8242 |  | 5563 | 55 | 55 | 60 | 5619 | 5633 | 5647 | 5661 | 5675 |  |
|  | 6391 |  |  |  | 6343 |  |  |  |  |  |  |  | 15 | 1523 | 1539 | 1556 | 1572 |  |  |  |  |
|  | 44.3 | 4433 | 44 | 44 | 439 | 4378 | 436 | 43 |  | 6.432 | 4 | 7417 | 7436 | 7455 | 7474 | 74 | 751 | 75 | 7548 | 7561 |  |
|  | 2503 | 24 |  |  |  | 2425 | 24 | 23 | 2378 |  | 33 | 3344 | 3366 | 3387 |  | 342 | 345 | 3471 | 3492 | 351 |  |
| 10 | 0558 | 0541 | 0524 | 0507 | 0489 | 472 | 0455 | 0638 | 20 | 8.0403 | 5.9248 | 272 | 9295 | 9318 | 9342 | 9365 | 938 | 941 | 9436 | 459 | 0 |
| 11 | 86 | 8595 | 8576 | 8557 | 8538 | 8519 | 8500 | 8481 | 8462 | $8 \cdot 8443$ | 6.5173 | 5199 | 5225 | 5250 | 527 | 5302 | 5328 | 5353 | 5379 | 540 | 11 |
| 12 | 66 | 6649 | 6629 | 66 |  |  | 6546 |  |  |  |  | 1126 | 1 | 71 | 1210 | 12 | 126 | 1295 | 23 | 1351 | 12 |
| 13 | 472 |  |  |  |  |  | 2 |  | 4546 | 10.45 | $7 \cdot 702$ | 7053 | 70 | 71 | 7144 | 71 | 7205 | 7236 |  | 729 | 3 |
| 14 | 2782 | 27 | 27 | 2709 | 2685 | 2661 | 2637 |  | 2588 |  | 8294 | 29 | 30 | 3046 | 3079 | 3111 | 31 | 317 | 10 | 3242 | 1 |
| 15 | 0838 | 0 |  |  |  |  |  |  |  |  | 8.8872 | 89 | 89 | 8978 | 9013 | 9048 | 90 | 9118 | 53 | 918 | 15 |
| 16 | 8893 | 8856 |  |  |  |  |  |  |  | 12.8645 |  |  |  |  |  |  |  |  |  |  | 16 |
| 17 | 69 | 692 | 689 |  |  |  |  |  |  |  | 10 |  |  |  |  |  |  |  |  |  |  |
| 18 | 50 | 49 | 494 | 49 |  | 4850 | 4819 |  | 475 | 14.47 | 10. |  | 6 | 67 | 6815 | 6858 | 6900 | 6942 | 6984 | 702 | 18 |
| 19 | 306 |  |  |  |  |  | 2864 |  | 279 | 15.2 | 11 |  |  | 27 | 2750 | 2794 | 2839 | 2883 | 27 | 297 |  |
| 20 | 1117 | 1082 | 1048 | 1013 | 0979 | 0944 | 0910 | 0875 | 0841 | 16.0 | 11.849 | 8543 | 8590 | 8637 | 684 | 8731 | 8777 | 8824 | 8871 | 3918 | 20 |
| 21 | 917 | 91 | 9100 | 9064 | 9028 | 8991 | 8955 | 8919 | 8883 | 16.8846 | 12 | 4470 | 4520 | 4569 | 4618 | 4667 | 4716 | 4765 | 4815 | 486 | 21 |
| 22 | 7228 |  |  |  |  |  |  |  |  | 17.6887 | 13.03 |  |  |  |  |  |  |  |  |  | 22 |
| 23 | 5284 | 52 | 5205 | 516 | 5126 |  | 5046 |  |  | 18．4927 | $13 \cdot 627$ |  |  |  | 64 | 65 | 6594 | 6648 | 6702 | 675 |  |
| 24 | 33 | 329 | 325 |  |  | 3133 | 3092 |  | 3009 | 19 | 14. | 2252 | 2308 | 236 | 242 | 24 | 2533 | 258 | 2645 | 270 | 24 |
| 25 | 1396 | 1353 |  |  |  |  | 1137 |  |  | 20．1007 | 14. |  | 8238 | 8296 | 8355 | 84 | 8472 |  | 8589 | 864 | 25 |
| 26 | 94 | 9407 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 75 |  |  | 736 |  | 727 |  |  | 713 |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | 55 | 551 |  |  |  | 5322 |  |  |  | $22 \cdot 512$ | 16.58 |  | 6026 | 609 | 615 | 6223 |  | 6354 | 6419 | 648 | 28 |
| 29 | 361 |  |  |  |  |  | 3319 |  |  |  | $17 \cdot 18$ |  |  | 202 |  |  |  |  | 2363 | 243 |  |
| 30 | 1675 | 1623 | 157 | 1520 | 1468 | 1416 | 1365 | 1313 | 1261 | $24 \cdot 12$ | 17•71 | 81 | 7885 | 95 | 802 | 8096 | 8166 | 8236 | 307 | 837 |  |
| 31 | 97 | 9678 | 9624 | 9571 | 9517 | 9464 | 9410 | 9356 | 9303 | 24.9249 | 18.36 | 3742 | 3815 | 3887 | 396 | 4032 | 4105 | 4178 | 4250 | 432 | 31 |
|  | 77 |  |  |  |  |  |  |  |  |  | 18.95 |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 584 | 5786 | 57 | 5672 | 5615 | 5558 | 5501 | 5444 | 538 |  | 19.55 |  |  |  |  |  |  |  |  |  |  |
| 34 | 38 |  | 37 |  |  |  |  |  |  | 27.3370 | 20.14 |  | 16 | 168 | 176 | 1842 | 1922 | 2001 | 2081 | 216 |  |
| 35 | 195 |  |  |  |  |  |  |  |  | 28.1410 | $20 \cdot 7369$ |  | 7533 | 7615 | 7697 | 77 |  | 942 | 3024 | 810 | 35 |
| 36 | ＋010 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 36 |
| 37 | 80 | 8002 | 793 | 787 |  | 7747 |  | 761 |  |  |  |  |  |  |  | 96 | 9738 |  |  |  |  |
|  | 61 | 6056 |  |  |  | 5794 | 5728 |  |  | 30．5531 | 22 |  | 53 |  | 54 | 55 | 5677 | 5766 | 5855 | 594 | 38 |
| 39 | 417 | 411 | 40 |  |  |  | 377 |  | 36 | ， | $23 \cdot 1$ |  | 125 | 1342 | 143 | 1525 | 161 | 1707 | 1798 |  |  |
| 40 | 2233 | 216 | 209 | 2027 |  | 1888 | 181 |  |  | 32．1612 | $23 \cdot 6$ | 70 | 7180 | 727 | 析 | 74 | 755 | 7648 | 774 | 83 | 40 |
| 41 | 0289 | 0219 | 0148 | 0077 | ＋006 | 9936 | 9865 | 9794 | 9723 | 32．9652 | $24 \cdot 2918$ | 3014 | 3110 | 3206 | ｜330 |  | 3494 | 3590 |  |  |  |
| 42 | 83 |  |  |  |  |  |  |  |  | $33 \cdot 7693$ | 24－8842 |  | 9039 | 9138 |  |  |  |  |  |  | 42 |
| 43 | 640 | 632 | 62 | 6179 | 6104 | 60 | 59 | 58 |  | 34．5733 |  | 4868 | 49 |  | 517 | 52 | 537 | 547 | 5573 | 67 |  |
| 4 | 44 |  |  |  |  | 40 | 4001 |  |  |  | 26.0692 |  | 08 |  | 110 |  | 1310 | 14 | 1516 | 61 | 44 |
| 45 | 25 | 243 | 235 | 2280 | 2202 | 2124 | 2047 |  | 189 | $36^{\circ} 1813$ | 26.6617 | 6722 | 6828 | 6933 | 703 | 7148 |  | 7354 | 460 | 756 | 45 |
| 46 | 0569 | 048 | 041 | 0331 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 862 | 854 |  | 838 |  | 8219 |  |  |  |  |  |  |  |  |  |  |  |  |  | （ | 47 |
| 48 | 66 |  |  |  |  | 6266 | 6183 | 6100 | 6017 | 38.5934 | 28.43 | 45 | 46 | 472 |  | 49 |  |  |  |  | 48 |
| 49 | 473 | 465 |  |  |  | 43 | 422 | 41 | 405 |  | $2{ }^{2} .03$ | 0431 | 054 | 066 |  | 08 | 1005 | 1119 | 23 |  |  |
| 50 | 2792 | 270 | 2619 | 25 | 447 | 2361 | 2274 |  | 210 | 40．2015 | 29.62 |  | 6475 | 659 | 67 | － | 69 | 7061 | 7178 | 729 | 50 |
| 51 | 0848 | 0760 | 067 |  |  |  |  |  | 0143 | 4 | 30 |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 89 | 88 | 87 | 8635 | 85 | 8455 | 83 |  |  |  | $30 \cdot 80$ |  |  | 845 |  |  |  |  |  |  |  |
| 5 | 69 | 68 | 6771 |  |  |  |  | 63 | 62 |  | $31 \cdot 4$ |  | 42 | 43 | 45 | 46 | 47 | 4884 | 硅 | 5138 |  |
|  | 50 |  |  |  | 4643 |  | 445 |  |  | 43.4176 |  |  |  | 032 |  |  |  |  | 0952 |  | 54 |
| 55 | 307 | 29 |  |  |  | 259 | 250 |  |  | 44．2216 | $32 \cdot 5865$ |  |  |  |  |  |  |  | 6895 | 202 | 55 |
| 56 | 112 | 103 |  |  |  |  |  |  | 035 | 45.0257 | $33^{\prime} 17$ |  |  |  |  |  |  |  |  |  | 56 |
| 5 | 9183 | 90 |  |  |  |  | 85 |  |  | 45 |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 723 | 7139 | 703 |  | 6838 | 6738 | 663 | 653 | 6438 | 46.6337 | 34 |  |  | 4047 | 418 |  |  |  |  |  |  |
|  | 52 |  |  |  |  |  |  |  |  |  |  |  | 9841 | 99 |  | 02 |  | 05 | 0669 |  |  |
| 60 | 33 | 3247 | 3143 | 3040 | 2936 | 2833 | 2729 | 2625 | 2522 | 48．2418 | $35 \cdot 5$ | 5630 | 5770 | 591 | 605 | 61 | 6332 | 647 | 6 | 675 | 60 |
|  |  |  |  |  |  |  |  |  |  |  | 36 |  |  |  |  |  |  |  |  |  |  |
|  | 9462 | 93 | 924 |  |  | 892 | 88 | 87 | 860 | ． 849 | 36 |  |  |  |  |  |  |  |  |  |  |
| 6 | 75 |  |  |  |  | 697 | 68 |  | 6648 | 50 | 37•32 | 34 |  | 37 |  |  | 41 |  |  | 459 |  |
|  | 557 | 546 | 53 |  |  | 5022 |  |  |  |  |  |  |  | 963 |  |  |  |  |  |  |  |
| 65 | 362 | 351 |  |  | 3181 | 306 | 295 |  | 27 | 2.26 | $38 \cdot 511$ | 526 | 5418 | 557 | 572 | 587 |  |  | 6331 |  | 65 |
|  | 16 | 15 |  |  |  | 116 |  |  | 077 |  | $39 \cdot 10$ | 119 | 134 | 150 |  |  |  |  | 274 | 428 | 66 |
|  |  |  |  |  |  |  |  |  | 816 | 53.87 |  |  |  |  |  |  | 79 |  |  |  |  |
|  | 779 | 76 | 75 | 7445 | 7328 | 721 | 70 | 69 | 6858 | 54.67 |  |  |  |  |  |  |  |  |  |  |  |
| 69 | 58 |  |  |  |  | 5258 | 51 |  | 4900 | 55478 | 40．88 | 8974 |  | 929 | 94 |  | 978 |  | －105 |  | 69 |
| 70 | 39 |  |  |  |  | 3305 | 318 |  |  |  | $41 \cdot 473$ | 480 | 5065 | 522 | 539 | 55 | 硅 | 58 | 6049 | 621 | 70 |
|  | 196 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 71 |
| 72 | －020 | 989 | 977 | 9648 | 9524 | 939 | 927 | 915 | 9026 | 57.890 | $42 \cdot 65$ | 6756 | 6924 | 7093 | 7262 | 743 | 759 | 寿 | 硣 | 81 | 72 |
|  | 8076 |  |  |  |  | 7446 |  |  | 7068 | 58.69 | $43 \cdot 25$ | 2683 | 2854 | 3025 | 3196 | 336 |  | 3708 | 矿 | 405 | 73 |
|  | 6132 | 600 | 587 | 49 | 5621 | 5494 | 53 | 5238 | 5110 | 59．4982 |  |  | 878 |  | 5130 | 52 |  |  |  |  |  |
| 75 | 41 | 4058 | 39 | 3800 | 3670 | 35 | 3411 | 3282 | 315 | 60．302 | 44.43 | 453 | 471 | 488 | 506 | 524 | 541 | 559 | 576 | 594 | 75 |
| 76 | 22 | 21 | ， |  |  | ， | － |  | 1194 | 1.106 | $45^{\circ} 02$ | 046 | 㖪 | 082 |  | 117 | 135 | 153 | 71 | 188 | 76 |
|  |  |  |  |  |  | 9635 |  |  | 923 |  |  |  |  | 675 | 693 | 713 | 仡 |  |  |  | 77 |
| 78 | 835 | 822 | 808 | 795 | 7817 | 7682 | 754 | 7413 | 7278 | 62.714 | $46 \cdot 21$ | 2319 | 250 | 268 | 286 | 304 | 3232 | 341 | 359 | 377 | 78 |
| 79 | 6411 | 6275 | ， | 7602 |  | 析 | 5593 |  | 5320 | 5184 |  | 8246 | 8431 | 861 | 880 | 898 | 917 | 9356 | 9540 | 972 | 79 |
| 80 | 446 | 4329 | 4191 | 4053 | 3915 | 3777 | 3639 | 3500 | 33 | 64．322 | 47－398 | 4173 | 436 | 458 | 473 | 砣 | 5110 |  |  | 567 | 80 |
|  | 2523 | 238 | 224 | 2104 | 1964 | 1824 | 168 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 82 | 05 | 04 | 029 | 0154 | ＋013 | 9871 | 973 | 95 | 944 | 65.930 | 48.58 | 6027 | 6219 | 641 | 66 | 679 | 69 | 719 | 737 | 75 | 82 |
| 83 | 863 | 836 | 834 |  | ¢111 | 791 | \％ |  |  |  |  | ， |  | 2343 | 253 | 273 | 928 | 12 |  |  |  |
|  | 669 | 654 | 640 | 62 | 61 | 59 | 58 | 56 | 5530 | $67 \cdot 5385$ | 49.768 | 788 | 8078 | 827 | 847 | 866 | 886 | 9062 | 9258 | 9 | 84 |
| 85 | 4 | 4600 |  |  |  | 4013 | 386 |  |  | 3425 | 50．361 | 3809 | 4008 | 4207 | 440 | 4605 | 4804 | 5003 | 520 | 54 | 85 |
| 86 | 28 | 265 |  |  |  | 2060 |  |  |  |  |  |  |  |  |  | 0 | 074 | 094 | 14 | 132 | 86 |
|  | 08 | 770 | 05 | 208 | 0258 | －107 | 9957 |  | 9656 | 70．75 |  | 1563 | 5867 | 6071 | 220 | 647 | 66 | 6827 | 7089 |  |  |
| 88 | 89 | 87 | － | 8458 | 8307 | 8155 | 8003 | 78 | 7698 | 70.75 | $52 \cdot 13$ | 159 | 179 | 2003 | 220 | 2415 | 26 | 28 | 303 | 323 |  |
| 89 | ， | 681 | 663 |  | 6355 | 6202 | 6048 |  | 574 |  |  | 7518 | 7726 |  | 143 | 835 | 8560 |  | 9 | 硅 | 89 |
| 90 | 5025 | 4870 | 4715 | 4560 | 4404 | 4249 | 409 | 3938 | 3783 | 72－362 | 53．323 | 3445 | 3655 | 3866 | 4077 | 428 | 4498 |  | 492 |  |  |
|  | 30 | 292 | 27 | 2610 | 2453 | 2296 | 2139 | 198 | 1825 | 73．166 | 53 | 9372 | 9585 | 9798 | ＋01 | 022 | 0437 | 065 | 0863 |  |  |
| 92 | 113 | 097 | 020 | 0661 | S502 | 0343 | 0185 | ＋02 | 9867 | 73．970 |  | 529 | 5514 | 5730 | 594 | 616 | 637 | 659 | 680 | 70 |  |
|  | 918 | 903 | 88 |  | 855 | 8391 | 8230 | 80 | 7909 | 75 | 55. | 122 | 7444 | 766 | 181 | 2097 | 231 | 253 | 寿5 | 296 |  |
| 9 | 7249 | 70 | 6925 | 6762 | 6600 | 6438 | 627 | 611 | 5951 | 75.578 | 55.693 | 715 | 7373 | 759 | 781 | 803 | 825 | 847 | 869 |  |  |
| 95 | 530 | 5141 |  |  |  |  |  |  |  | 76．3828 | 56.2858 |  |  | 3525 | 3748 | 3970 | 4193 | 4415 | 4637 | 485 | 95 |
|  | 3360 | 195 |  |  |  |  |  |  | 矿 |  |  |  |  |  |  | 9907 |  |  |  |  |  |
| 97 | 141 | 124 | 1082 | 09 | 0747 | 057 | 041 | 02 | －077 | 77－990 | 5747 | 4935 | 5162 | 5389 | 561 | 584 | 607 | 6297 | 6524 | 6rs |  |
|  | 9472 | 9303 | 138 |  |  | 8627 | 845 | 8288 | 8119 | 78．794 |  | 0862 | 1091 | 1321 | 155 | 1780 | 200 | 223 | 246 | 269 | 98 |
|  | 7528 | 735 |  |  |  |  |  | 6332 | ， | 79－5990 | 58 | 678 |  | 7253 | 7485 | 7816 | 7948 | 180 | 84 |  | 99 |
|  | 5584 | 5411 | 5239 | 5066 | 4894 | 4721 | 4548 | 4376 | 4203 | 80．403 | 59．2482 | 2716 | 2951 | 3185 | 3419 | 3653 | 3887 | 412 | 4355 | 4589 | 100 |
|  | $40^{\circ}$ | $39^{\prime}$ | 38 | 37 | $36^{\prime}$ | $35^{\prime}$ | $34^{\prime}$ | $33^{\prime}$ | $32^{\prime}$ | $31^{\prime}$ |  | $39^{\prime}$ | $38^{\prime}$ | $37^{\prime}$ | $36^{\prime}$ | $35^{\prime}$ | $34^{\prime}$ | $33:$ | $32^{\prime}$ | $31^{1}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| 36 |  |  |  |  | Cosine． |  |  |  |  |  | Sine． 36 |  |  |  |  |  |  |  | $36^{\circ}$ |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 40 | ， | $42^{\prime}$ | 43 | $44^{\prime}$ | T $45^{\prime}$ | $46^{\prime}$ | $47^{\prime}$ | 48＇ | $49^{\prime}$ | 40 | 41 | $42^{\prime}$ | 43 | $44^{\prime}$ | ［45 | 46＇ | $47^{\prime}$ | $48^{\prime}$ |  |  |
|  | 302 | 801 | 8018 | 8016 | 8014 | 8013 | 8011 | 8009 | 8007 | ${ }^{8006}$ | ${ }^{5972}$ | 5974 | 5976 | 5979 | 5981 | 5983 | 5986 | 5988 |  |  |  |
|  | 6042 | 603 | 60 | 60 | － |  |  | 60 |  | 1.601 | $1 \cdot 19$ | 19 | 1953 | 1957 | 1962 |  | 1971 |  |  |  |  |
|  | 4064 | 405 | 4053 | 4048 | 4043 | 4038 | 4032 | 402 |  | 24 |  |  |  | 7936 | 43 | 7950 | 7957 | 796 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3933 | 3942 |  |  |  |  |
|  | 0106 | 0097 |  |  | 0071 |  |  |  |  | 4.00 | 2.9858 | 987 | 988 | 9893 | 9905 | 9916 |  | 9940 |  |  |  |
|  | 8127 | 811 | 8107 | 8096 | 808 | 807 |  | 8054 | 8044 | $4 \cdot 80$ | $3 \cdot 5$ | 584 | 585 | 5871 | 5885 | 5899 | 5913 | 592 | 5941 | 5955 |  |
|  | 6149 | 6136 | 6124 | 6112 | 6100 |  |  |  | 60 |  |  | 18 | 18 | 1850 | 1866 | 188 | 1899 | 191 | 1932 | 194 |  |
|  | 4170 | 4156 | 4142 | 4128 | 4114 | ${ }^{1}$ | 4086 | 4072 | 4059 | 6.4045 | 4.7773 | 7791 | 7810 | 7829 | 7847 | 7866 | 7885 |  |  | 794 |  |
|  | 2191 | 2175 | 216 | 21 | 2129 | 2113 | 2097 | 2082 | 2066 | 050 | 5.3744 | 3765 | 3786 | 3807 | 3828 | 384 | 387 | 3891 |  |  |  |
| 10 | 0212 | ， | \％178 | 0160 | 143 | 0125 | ， | 0091 | 073 | 8．005 | 5.9716 | 9739 | 9763 | 978 | 8178 | 9832 | 9856 | 87 | 9902 | 992 | 0 |
| 11 | 8234 | 8214 | 8195 | ${ }^{8176}$ | ${ }^{8157}$ | ${ }^{81}$ | 811 | 8100 | 8080 | $8 \cdot 806$ | 6.5687 | 5713 | 5739 | 576 | 5790 | 5816 |  | 5867 |  | 5918 | 11 |
| 12 | 6255 | 6234 | 6213 | 6192 | 6171 | 6150 | 6130 | 6109 | 6088 | 60 | $7 \cdot 1659$ | 1687 | 1715 | 1743 | 1771 | 1799 | 182 | 18. |  |  | 12 |
| 13 | 4276 | 4253 | 423 | 4208 | 41 | 4163 | 4140 | 4118 | 4095 | ， | $7 \cdot 76$ | 7661 | 7691 |  | 7752 | 778 | 781 |  |  |  | 13 |
|  | 2297 | 22 | 22 | 2 | 2200 |  |  | 2127 | 210 |  | 8.36 | 36 | 361 |  | 373 | 376 | 37 | 383 | 386 |  | 4 |
| 15 | 231 | 0292 | 0266 | 0240 | 0214 |  | 0162 | 0136 | 01 | 12. | 8.95 |  |  | 967 | 97 | 9749 | 9784 | 9819 | 9854 | 9888 | 5 |
|  | 834 | 831 | 82 | 82 | 82 | 82 | 3 | 8145 | 81 | ${ }^{12}$＇8089 |  |  |  |  |  |  |  |  |  |  | 16 |
|  | 636 | 63 | 630 | 62 | 62 | 6213 | 34 | 61 | 6124 |  | 10.15 | 1557 | 1596 | 1636 | 676 | 1715 | 1755 | 17 | 134 | 1874 | 17 |
| 18 | 4382 | 4351 | 4320 | 428 | 425 | 4226 | 4194 | 416 | 4132 | 14.41 | $10 \cdot 7$ | 7531 | 7573 | 7614 | 7656 | 7698 | 7740 | 77 |  |  | 18 |
| 19 | 2403 | 2370 | 2337 | 230 | 2271 | 22 | 2205 | 217 | 2139 | 15.2106 | 113460 | 3504 | 3549 | 3593 |  | 3682 | 372 |  |  |  | 9 |
| 20 | 0425 | 0390 | 0355 | S20 | 0286 | 0251 | 0216 | 18 | 0146 | 16.0111 | 11.9432 | 94 | 9525 | 9572 | ．9618 | 9665 | 971 | 9758 | 980 | 98 | 20 |
| 21 | 8446 | 8409 | 8373 | ${ }^{8336}$ | 8300 | 8263 | ${ }^{822}$ | 81 | 8154 | 16．811 | 12.5403 | 5452 | 15501 | 5550 | 559 | 564 | 569 | 57 |  |  | ， |
|  | 6467 | 6429 | 6391 | 6352 | 6314 | 6276 | 6238 | 61 | 6161 | $17 \cdot 6123$ | $13 \cdot 13$ | 1426 | 1478 | 1529 | 1580 | 163 | 1683 | 17 |  |  | 2 |
| 23 | 4488 | 4448 | 4408 | 43 | 4328 | 4288 | 48 | 42 | 4168 | 18.4128 | $13 \cdot 73$ | 74 | 7454 | 75 | 7561 | 761 | 766 | 772 | 77 |  | 23 |
|  | 251 | 246 | 24 | 23 | 23 | 2301 |  | 22 | 21 | 19 | 14．3 | 337 | 34 | 3486 |  | 3598 | 365 | 37 |  |  | 24 |
| 25 | 53 | 04 | 04 | 0400 | 03 | 03 | 0270 | 0226 | 0183 | 20.0139 | 14.9 | 934 | 9406 | 9465 | 9523 | 9581 | 963 |  |  |  |  |
| 26 |  | 850 | 84 | ${ }^{8416}$ | 837 | 83 |  | 235 | 819 | 20.8145 | 155 |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 6573 | 652 | 647 | 6432 | 63 | 63 |  | 6245 | 619 |  | 16.123 | 12 | 13 | 14 | 148 | 1548 | 161 | 167 | 173 |  | 27 |
| 28 | 4594 | 45 | 449 | 4449 | 4400 | 435 |  | 4254 | 42 |  |  |  | 73 |  | 746 | 753 | 759 | 76 |  |  | 28 |
| 29 | 2616 | 256 | 25 |  |  | 23 | $23 / 3$ | 2263 | 2212 |  |  | 321 | 33 | 3379 | 3447 | 35 | 358 |  |  |  |  |
| 30 |  | 0585 | 0533 | 0481 |  |  |  | O272 | 0219 | 24 | 17.9148 | 9218 | 9288 | 935 | 942 | 94 | 95 | 9637 | 9707 | 977 | 30 |
| 31 | 8658 | 8602 | 8550 | 8497 | 8443 | 838 | ${ }^{8335}$ | 8281 | 8227 | $24 \cdot 1773$ | 18.5119 | 5191 | 5264 | 533 | 5408 | 548 | 55 | 562 | 56 |  | 31 |
| 32 |  | 6624 | 6568 | 6513 | 64 | S4 | 63 | 9 | 6234 | 25 | 19.10 | 1165 | 12 | 13 | 1389 | 146 | 153 | 161 |  |  | 32 |
| 33 | 4701 | 4643 | 4586 | 4529 | 4471 | 4414 | 435 | 4299 | 4241 | $26^{\prime} 4$ | 19.7 | 71 | 7216 | 72 | 7370 | 744 | 752 | 763 | 767 |  | 33 |
| 34 |  | 26 | 26 | 2545 | 2485 |  | 2367 | 2308 | 2249 | $27 \cdot$ | $20^{\circ}$ | 3113 | 319 | 32 | 33 | 343 | 35 | 358 |  |  | 34 |
| 35 | 074 | 0682 | 0621 | 0561 | 0500 | 0439 | 0378 | 0317 | 0256 | 28.01 | $20^{\circ}$ | 9087 | 916 | 92 | 933 | 9414 | 949 | 957 | 9658 |  | 35 |
|  | 8764 | 870 | 8639 | 8577 | 85 | 84 | 83 | ${ }^{3} 26$ | 826 | $28^{8}$ | 21／49 | 5061 |  |  |  |  |  |  |  |  |  |
| 37 |  | 672 | 6657 | 6593 | 65 | 64 | 63 | 6335 | 627 | 20 | 22．09 | 1035 | 112 | 12 |  | 138 | 146 | 15 | 16 |  | 37 |
| 39 | 4807 | 47 | 4675 | 4609 | 4543 | 4476 | 44 | 4344 | 4278 | $30 \cdot 421$ |  | 703 |  | 718 |  | 736 | 745 | 75 |  |  | 38 |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 307 |  |  |  | 3438 | 3528 |  |  |  |
| 40 |  | 0780 |  |  | 0571 | 0502 |  |  | 0293 | 23 |  | 8 | 9050 | 914 | 923 | 硣 | 942 | 951 |  |  | 0 |
| 41 |  | 87 | 8728 | 8657 | 8585 | 851 |  | 8371 | 83 | 32．8228 | $24^{4} 4835$ | 4931 | 5026 | 512 | 5218 | 531 | 540 | 5504 | 500 | 569 | 4 |
| 42 |  | 681 | 6746 | 6673 | 660 | 6527 |  | 6380 | 6307 | 33． 6234 |  | 0905 |  |  | 11 | 129 | 139 | 1492 | 1590 |  | 2 |
| 43 |  | 4838 | 4764 | 4689 | 4614 | 4539 | 4464 | 4389 | 4315 |  |  | 687 | 6979 |  |  |  | 7380 | 7480 | 7580 |  | 3 |
| 44 |  | 285 | 278 | 2705 |  | 2552 |  |  | 2322 | 35．2251 | $26 \cdot 2750$ | 2852 | 295 | 305 | 31 | 326 | 336 | 346 | 357 |  | 4 |
| 45 | 0955 | 087 | 079 | 0721 | 0643 | 0564 | 048 | 04 | 0329 | 36.025 | 26.8721 | 8826 | 8931 | 903 | 914 | 924 | 93 | 945 | 956 | 96 | 45 |
|  | 897 | 8897 | 8817 | 8737 | 8657 | 8577 | 8497 | 8417 | 8336 | $3{ }^{36} 8$ | 27.4 | 480 | 490 | 50 | 512 | 5229 |  | 54 |  |  |  |
| 47 |  | 691 | 68 | 6753 | 6671 | 65 | S | 6426 | 6344 | $37 \cdot 6$ | 28.06 | 0774 | 088 | 09 | 1103 | 121 | 132 | 143 | 154 | 16 | 47 |
| 48 | 501 | 4 | 485 | 476 | 4685 | 46 | 4518 | 4435 | 435 | 38 |  | 6748 | 686 | 69 | 7084 |  | 730 | 741 | 531 | 76 | 8 |
| 50 |  |  |  |  |  |  |  |  | 23 |  |  |  | 28 |  | 3065 | 317 | 329 | 340 | 35 |  |  |
| 50 | 1062 | 0975 |  | 08 | 0714 | 0627 |  |  |  |  |  |  | 8813 |  | 9046 | 9162 | 9279 | 939 | 5512 |  |  |
| 51 |  | 89 |  |  |  |  | 855 |  |  |  |  |  |  |  |  |  |  | 538 | 5502 |  | 1 |
|  |  |  | 6923 | 68 |  | 6 | 65 | 64 | 638 |  |  | 064 | 0765 |  | 10 | 112 | 125 | 137 | 1492 |  |  |
| 53 | 512 | 503 | 49 | 4849 | 4757 | 4665 | 4572 | 4480 | 4388 | 42．4295 |  | 6618 | 6741 | 68 | 698 | 711 | 222 | 漖 | 7483 |  | 53 |
| 54 |  | 30 | 29 | 2865 | 2771 |  | 25 |  | 2395 | 43.2301 |  |  | 281 | 283 |  | 309 | 322 | 3347 | 3473 |  | 54 |
| 55 | 1168 | 107 | 09 | 088 | 0785 | 0690 |  | 0498 | 0402 | 44.0306 | 32．84．3 | 8566 | 869 | 882 | 8950 | 907 | 9207 | 9335 | 9463 | 959 | 55 |
| 56 | 9189 | ${ }^{9092}$ | ${ }^{8994}$ | ${ }^{8897}$ | 8800 | 8702 | ${ }^{8605}$ | 8507 <br> 6516 | ${ }^{8410}$ | 44．831 | 33．400 | 4539 | ${ }^{467}$ | 480 | 49 | 506 | 519 | ${ }^{533}$ | 54. | 55 |  |
|  |  | 711 | 7012 | 6913 | 6814 | 6715 | 6 | 6576 | 6417 | 45.6318 | 34．0380 | 0513 | O62 | 077 |  | 162 | 11 | 131 |  |  | 5 |
| 58 |  | 513 | 50 | 4929 | 4828 | 4727 | 46 | 4525 | 4424 | $46 \cdot 432$ | 34 | 6487 | 662 | 675 | 6893 | 702 | 716 | 729 |  |  | 58 |
| 60 | 325 | 315 | 3048 | 2945 |  | 2740 |  |  | 2432 |  |  | $2{ }^{2}$ |  |  |  |  |  |  |  |  | 㖪 |
| 60 | 127 | 11 | 1065 | 0961 | 0857 | 07 |  |  | 0439 | 48 | 35 | 8435 | 8575 | 8715 | 8855 | 8995 | 913 | 9274 |  |  |  |
|  |  | 91 |  | 8977 | 8871 |  | 86 | 8552 | 8446 | 48 |  | 4409 |  |  |  |  |  |  | 54 |  |  |
|  |  | 7209 | 71 | 699 | 6885 | 67 | 65 | 6561 | 645 |  |  | 03 | 05 | 067 | 0817 | 0961 |  |  |  |  | 62 |
| 63 | 5338 | 52 | 51 | 50 | 4900 | 4790 | 46 | 4571 | 446 | 50 | 37 | 6357 | 6504 | 665 | 6798 | 6944 |  | 723 |  |  | 63 |
| 64 |  | 32 | 31 | 30 | 29 |  | 26 | 2580 |  |  |  | 233 | 24 |  |  | 2923 | 307 |  | 93 |  | 64 |
| 65 | 138 | 1267 | 1154 | 1041 | 0928 | 0815 | 0702 | 0589 | 0475 | 52．0362 | $38 \cdot 8153$ | 8305 | 845 | 860 | 875 | 891 | 90 | 92 | 9365 |  | 65 |
| 66 | 9401 | ${ }^{9287}$ | 9172 | 9057 | 8942 | 8828 | ${ }^{8713}$ | 8598 | 8483 | $52 \cdot 8368$ | 39．4125 | 4279 | 4433 | 458 | 4740 | 489 | 5048 | 5202 | 535 | 55 |  |
|  |  | 730 | 719 | 707 | 6957 | 6840 | 6723 | 6 | 649 | 53．6373 | 4 | 0253 | 04 |  | 0721 | ¢87 | 103 | 90 | 1348 |  | 7 |
| 68 |  | 532 | 5207 | 5089 | 4971 | 4853 | 4734 | 4616 | 4497 | 54：4379 | 40．6068 | 6226 | 6385 | 65 | 67 | 686 |  | 7178 |  | 74 | 68 |
| 69 |  | 334 | 3225 | 3105 | 29 |  | 27 | 2625 | 250 | 55 |  |  | 23 | 25 | 268 | 284 | 300 | 3166 | 3326 |  | 69 |
| 70 | 1486 | 1365 | 1243 | 1121 | 0999 | 0878 | 0756 |  | 0512 | 56. | $4{ }^{\text {P }}$ | 17 | 833 |  |  |  |  | 9153 | 931 |  | \％ |
|  |  | 93 | 926 | 9153 | 90 | 88 |  | ${ }^{86}$ | 85 |  |  |  |  | 44 |  | 4810 |  |  |  |  | 1 |
| 72 | 752 | 74 | 727 | 715 | 70 | 69 | 677 | 66 | 652 | 57 | $42 \cdot 9$ | －12 | 02 | 04 | 062 | 079 | 096 | 112 | 129 | 14 | 72 |
| 73 74 7 | 5550 | 54 | 529 | 51 | 5042 | 4915 | 47 |  | 453 |  |  |  |  |  |  | 6777 |  |  | 7287 |  | 3 |
| 74 75 7 |  | $34$ | $331$ |  |  |  |  |  |  |  | 44 |  |  |  |  |  |  |  |  |  | 74 |
| 76 | 9614 | 94 | 93 | 1 | 9085 | 8953 | 8821 | 3688 | 8556 | 60．842 | 45＇384 | 4018 | 4195 | 437 | 4550 | 472 | 490 | 508 | 525 |  | 76 |
|  |  | 75 | 7367 | 72 |  | 6965 | 63 | 6697 | 6563 | 61.6429 | 45 |  | ＋17 | 0351 | 0530 | 0710 |  | 1069 | 1248 |  | 7 |
| 78 | 5656 | 5521 | 53 | 5249 | 5114 | 4978 | 48 | 476 | 4570 | 62．4435 | $46 \cdot 5784$ | 596 | 6148 | 632 | 65 | 669 | 68 | 70 |  |  | 78 |
| 80 |  | 3540 | 3403 | 3265 | 18 |  |  | 27 | 2578 | 63.2440 | $47 \cdot 1755$ | 194 | 212 | 23 | 249 | 267 | 286 | 304 | 32 | 341 |  |
| 80 | 1699 | 1560 | 1420 | 1281 | 1142 | 1003 | 086 | 0724 | 0585 | 64.0446 | 47.7727 | 791 | 8100 | ${ }^{228}$ | 8473 | 8660 | 884 | 9032 | 921 | 940 | 80 |
| 81 82 | 972 | 957 | 9438 | 297 | 7171 | \％ | 88 | 734 | 8592 |  | 48.36 | 381 |  |  | 44 | 46 | 4832 | 5020 |  |  |  |
| 82 | 7741 | 759 | 7456 | 7313 | 7171 | 7028 | 688 | 6743 | 6600 | $65^{\circ} 64$ | 48.967 | 986 | ＋053 | 022 | 04 | 06 | 0817 | 1008 | 119 |  | 2 |
|  | 5762 | 561 | 547 | 5329 | 5185 | 50 | 489 | 475 | 460 | $66^{4} 44$ | 49.56 | 58 | 60 | 62 | 64 | 66 | 6803 | 699 | 7190 |  | 83 |
| 84 85 88 | 3783 | 3638 | 3420 | 3346 | 3199 | 066 |  | 2770 | 062 | 580 |  |  | 2005 | 2201 |  | $2593$ |  |  | 3180 |  |  |
| 85 |  | 1657 | 1509 | 1362 | 14 | 066 | 018 | 0777 | 0622 | ${ }^{68} 8^{0.0474}$ | 5075 | 7783 |  | 18 | 8378 | 857 |  |  | 9170 |  |  |
|  | 782 | 7696 | 7545 |  | ${ }_{7242}$ |  |  | ${ }_{678}^{877}$ | ${ }_{663}^{862}$ |  |  | 9757 |  | 415 |  | $\mid 4559$ | 4760 |  | 5160 <br> 1151 <br> 1 |  | 86 87 87 |
| 88 | 5868 | 57 | 5563 | 5410 |  |  | 4950 | 4797 | 4644 |  |  | 57 |  |  | 632 |  |  |  | 7 |  |  |
|  |  | 37 |  |  |  |  |  | 2806 |  |  | 53.1471 | 1575 | 1886 | 209 | 231 | 250 | 2716 | 292 | 313 |  |  |
| 90 | 1911 | 1755 | 1598 | 1442 | 1285 | 128 | 0972 | 0815 | 0658 | 72：0501 | 53.7443 | 7653 | 7863 | 8072 | 8282 | 8492 | 8702 | 8912 | 9121 | 9331 | 90 |
| 91 | 9932 | ${ }^{9774}$ | 196 | 9458 |  | 9141 | 898 | ${ }^{8824}$ | 8666 | 72.85 | 54．3414 | 3627 | 383 | 405 | 42 | 4475 |  | 489 |  |  |  |
|  |  | 7794 | 7634 | 7474 | 7314 | 7153 | 6993 | 6833 | 6673 | 73.6513 | 54．9386 | 9601 | 9815 | 103 | 024 | 0459 | 73 | 0887 | 1102 | 13 |  |
| 93 | 597 | 5813 | 5651 | 5490 | 5328 |  | 5004 | ${ }^{6842}$ | 4680 | 74.4518 | 55.5357 | 5574 | 579 | 600 | 622 | 644 | 59 | 687 |  |  | 93 |
| 94 | 3996 | 3833 | 3669 | 3506 | 3342 | 3179 | 3015 | 285 | 268 | $75 \cdot 252$ | $56 \cdot 1329$ | 154 | 176 |  |  |  | 26 | 286 |  |  | 94 |
| 95 | 2017 |  | 1687 | 1522 | 1356 | 1191 | 026 | 0860 | 069 | 76．052 | 56．73 | 75 | 77 | 796 | 818 | 84 | 863 | 8851 | 9072 |  |  |
| 96 | ． 03 | 987 | 9705 | 953 | 93 | 9204 | ${ }^{9037}$ | ${ }^{8869}$ | 870 | 76.85 | 57.327 | 349 | 37 | 394 | 416 | 439 | 461 | 483 |  |  |  |
| 97 | 8060 | 7891 | 7722 | 7554 | 73 | 7216 | 704 | 6878 | 670 | $77 \cdot 65$ | $57 \cdot 924$ | 947 |  | 992 | －1 | 037 |  |  | 1053 |  |  |
| 98 |  | 5911 |  |  |  |  |  | 4887 | 4717 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 1950 | 1776 |  | 3414 | 1254 | 1080 | 0906 | 0731 | ${ }_{80} 78$ | 59.1187 59.7159 | 1418 | 262 | 785 | 8092 |  | 8558 | 8791 | ${ }^{3033}$ |  |  |
|  | $20^{\prime}$ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ | $13^{\prime}$ | $12^{\prime}$ | $11^{\prime}$ | $20^{\circ}$ | 39 | 7 | 崖 | $16^{\prime}$ | 15＇ | 855 | $13^{\prime}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $36^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $36^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $51^{\prime}$ | ， | $53^{\prime}$ | 54 | $55^{\prime}$ | $56^{\prime}$ | $67^{\prime}$ | 58 | 59 | 50 | 51 | 62＇ | 53 | $54^{\prime}$ | 65 | 56 | 57 | 38 |  |  |
|  | 8004 | 80 | 800 | 7999 | 7997 |  | 7993 | 799 | 799 | 798 | 5995 | 5997 |  | 6002 | 6004 | 6007 | 6009 |  |  |  |  |
|  | 6008 | 6004 | 6001 | 5997 | 59 |  | 5987 |  |  |  | 1990 | 1994 | 1999 |  | 2008 | 2013 |  | 2022 |  |  |  |
|  | 401 | 4006 | 4001 | 399 | 399 | 39 | 3980 | 3975 | 3970 |  |  | 7992 | 79 | 800 | 8013 | 802 | 802 | 3034 | 304 | 8047 |  |
|  | 2015 | 2008 | 2001 | 199 | 1987 | ， | 寿 | 1966 |  | 3．195 |  | 3989 | 3998 |  | 4017 | 402 | 403 | 4045 | 4054 | 4063 |  |
|  | 0019 |  |  |  |  |  |  |  |  |  |  |  |  |  | 0021 | 0033 |  | 0056 |  |  |  |
| 6 | 8023 | 8012 | 8002 | 7992 |  |  |  |  |  | $4 \cdot 7929$ |  | 5983 | 5997 |  | 6025 | 6039 | 6053 |  |  |  |  |
|  | 6027 | 601 | 60 | 59 | 597 |  | 5953 | 5941 |  |  |  |  |  |  | 2029 | 2046 | 2062 | 2078 |  | 211 |  |
| 8 | 4031 | 4017 | 4003 | 3989 | 3975 | 3961 |  |  | 3919 | 保 | 4．795 | 7978 | 79 | 80 | 8034 | 805 | 801 | 808 | 8108 | 81 |  |
|  | 20 |  | 2003 |  | 1972 | 析 |  | 1924 | 1909 |  |  | 397 | 39 | 4017 | 4038 | 405 | 408 | 410 | 412 | 414 |  |
| 10 | 003 | 0021 | －003 |  | 9968 | 51 | 9934 | 9916 | 9899 | 7.9881 | 5.9949 | 9972 | 9995 | ． 019 | 0042 | 006 | 0089 | 0112 | 0135 | 015 | 0 |
| 11 | 80 | 80 | 8004 | 7985 | 7965 | 7946 | 7927 | 7908 | 788 |  | 6.5944 | 5969 | 5995 | 6021 | 6046 | 6072 | 6097 | 6123 | 6149 | 6174 |  |
| 12 | 60 | 6025 | 仡 | 5 |  |  |  |  |  | 10387 |  | 19 |  |  |  | 2078 | 2106 | 2134 |  |  | 2 |
| 13 | 405 | 4027 | 4004 | 3982 | 3959 | 3936 | 3914 | 389 | 3868 | 10.384 | 7793 | 7964 | 799 | 8024 | 8055 | 8085 | 8115 | 8145 | 8176 | 8206 | 13 |
| 14 | 2054 | 2029 | 2005 | 19 |  |  | 1907 | 1882 | 1858 | 11783 | $8 \cdot 39$ | 39 | 39 | 40 | 405 | 409 | 412 | 415 | 4789 | 4222 |  |
| 15 | 00 |  |  |  |  |  |  |  |  | 11 |  |  |  |  | 006 | 09 | 133 |  |  | 0237 | 15 |
| 16 | 8061 | 8033 | 8005 | 7977 |  |  |  | 7866 | 7838 | 12.7810 | 9．5918 | 5956 | 5993 | 6030 | 6067 | 104 | 6142 | 6179 |  |  | 16 |
| 17 | 60 | 603 | 600 | 5976 | 59 | 59 |  | 58 | 5828 |  | 10.19 | 19 |  | 2032 | 207 | 21 | 21 | 2190 | 2230 | 2269 | 17 |
| 18 | 406 |  | 40 |  |  |  |  | 38 | 38 | 14．378 | 10 | 79 |  |  | 8076 | 81 | 8159 | 8201 | 8243 |  | 8 |
| 19 | 2073 | 20 | 2006 | 1973 |  |  | 1874 | 1840 | 1807 | 15.17 |  |  | 399 | 4036 | 4080 | 4， | 416 | 4212 | 4257 | 430 | 19 |
| 20 | 0077 | 0042 | 1007 | 9972 | 9937 | 9902 | 9867 | 9832 | 9797 | 15.97 | 11 | 99 | 999 | 1038 | 008 | 013. | 017 | 022 | 0270 | 031 | 20 |
| 21 | 808 | 8044 | 8007 | 7970 | 7934 |  | 7860 | 7824 | 7787 | 16.775 | 12 | 5942 | 5991 | 6039 | 608 | 6137 | 618 | 5235 | 628 | 6332 | 1 |
| 22 | 60 |  | 6007 |  | 5931 | 5892 |  | 5815 | 577 | 17.5738 |  | 1939 | 1990 |  | 2092 | 2144 | 2195 |  |  |  | 22 |
| 23 | 40 | 40 | 40 | 396 | 3927 | 3887 | 47 | 3807 | 376 | 18.37 | 13 | 79 | 7990 | 8043 | 809 | 815 | 82 | 8257 |  | 8364 | 23 |
| 24 | 208 | 20 | 20 |  | 1924 |  | 1840 | 1798 |  | 19 | 14 |  |  | 40 | 410 | 41 | 42 |  |  |  | 24 |
| 25 | 0096 |  |  |  |  |  |  |  |  | 19.97 | 14．9872 |  |  |  | 0105 |  |  |  |  |  | 5 |
| 26 | 8100 | 8054 |  |  |  |  |  | 7782 | 7736 | 20.769 | $15 \cdot 586$ | 5928 | 5988 | 6049 | 6109 | 170 | 6230 |  |  |  | 26 |
| 27 | 6103 | 60 | 6009 | 596 | 59 |  |  |  | 572 |  |  |  |  |  | 2113 |  |  |  |  | 242 | 27 |
| 28 | 4107 | 40 | 4009 |  | 3912 |  | 3814 |  |  | $22 \cdot 366$ | 16 |  |  | 8053 | 8118 | 81 |  |  |  |  | 28 |
| 29 | 2111 |  |  | 195 |  |  | 1807 | 1757 | 1706 |  |  |  | 3987 | 4054 | 412 | 418 | 425 | 43 | 4392 | 445 | 29 |
| 30 | 011 | 0062 | －010 | 9958 | 9905 | 9853 | 980 | 9748 | 969 | 23.9643 | 17.98 | 99 | 99 | －056 | 012 | 0196 | 0266 | 033 | 0405 | 047 | 30 |
| 31 | 81 | 8065 | 8010 | 7956 | 7902 | 7848 | 7794 | 7740 |  | $24 \cdot 7631$ | 18.5842 | 5914 | 5986 | 6058 | 6130 | 6202 | 6274 | 6347 | 6419 | 649 | 31 |
| 32 | 612 |  |  |  |  |  |  |  |  | 25.561 | 19.18 | 1911 |  |  | 2134 |  |  |  | 432 |  |  |
| 33 | 412 | 406 | 4011 | 3954 | 38 | 3838 | 3781 | 372 | 366 | $26 \cdot 360$ | 19 | 790 | 7985 | 8062 | 8139 | 82 | 8292 | 8369 | 8446 | 852 |  |
| 34 | 21 | 20 | 2011 | 195 | 1893 |  | 1774 | 17 |  | 27．15 | 2 |  |  | 40 | 414 | 42 |  |  |  |  |  |
| 35 | 0134 | 0073 | －012 |  |  |  |  |  |  | $27 \cdot 95$ | $20 \cdot 9821$ |  |  |  |  |  |  |  |  |  | 35 |
| 36 | 8138 |  | 8012 |  |  |  |  |  |  | 28.7572 |  |  |  |  |  |  |  |  |  |  | 36 |
| 37 | 614 | 607 | 60 | 594 | 5883 |  |  |  | 56 |  |  |  |  |  |  |  |  |  |  |  | 37 |
| 38 | 414 | 4079 | 40 | 3947 | 3880 |  | 3747 | 3681 | 361 | 30．35 | 22 |  |  | 807 | 81 |  |  |  | 8513 |  | 38 |
| 3 | 214 | 2081 | 2013 | 1945 |  |  | 1741 | 1673 | 160 |  |  |  |  | 4073 | 416 | 42 | 434 | 43 | 452 | 461 | 39 |
| 40 | 015 | 0083 | 14 | 9944 | 987 | 9804 | 9734 | 664 | 95 | 31. | 23 | 98 | 99 | 075 | 016 | 026 | 035 | 44 | 54 | 063 | 40 |
| 41 | 815 | 8085 | 8014 | 7942 | 7871 | 7799 | 7727 | 7656 | 758 | 32.751 | 24．5791 | 5886 | 5982 | 6077 |  | 6268 |  | 6458 |  | 664 |  |
| 42 | 616 | 6087 | 6014 | 594 | 5868 |  |  | 5647 |  | 33＇5500 |  |  |  | 2079 |  |  |  |  |  |  |  |
| 4 | 4165 | 40 | 40 |  |  |  |  | 3639 | 356 | 34．348 |  |  |  | 8081 |  | 828 |  |  |  |  |  |
| 44 | 216 | 2092 | 2015 | 193 |  | 1784 | 1707 | 1631 |  | 35．1477 | 26 |  |  | 40 | 418 |  |  | 4492 | 459 | 69 |  |
| 45 | 01 | 0094 | －015 | 9937 | 9858 | 9780 | 9701 | 9622 | 9543 | 35.9465 | 26.9770 | 9875 |  | ． 085 |  |  |  | 0503 | 260 | 0712 | 4 |
| 46 | 8176 |  | 8016 |  |  |  |  |  |  | 367453 |  |  |  |  |  |  |  |  |  |  |  |
| 47 | 618 | 609 | 601 |  |  |  |  |  | 5523 |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 | 418 | 4100 | 40 | 39 |  |  |  |  | 3513 | 342 | 28．775 |  |  | 8090 |  |  |  |  |  |  |  |
| 49 | 218 | 02 | 2017 | 1931 |  | 1760 | 1674 | F89 | 1503 | $39 \cdot 141$ | $29 \cdot 3$ | 386 | 39 | 4092 | 420 | 432 | 443 | 5 54 | 466 | 477 |  |
| 50 | 019 | 0104 | 4017 |  |  | 9755 |  |  | 9493 | 39.940 | $22^{\circ}$ |  |  | 09 |  |  |  |  |  | 079 |  |
| 51 | 819 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 |  |  | 6018 |  | 583 | 5745 |  |  | 547 | 41.5381 |  |  | 1977 |  |  |  |  |  |  |  |  |
| 53 | 42 | 41 | 4018 | 39 | 38 | 3740 |  | 35 | 346 | 42 ．33 | 31 |  | 79 | 809 | 82 | 83 |  | 8592 |  |  |  |
| 54 | 22 | 1 | 2018 | 1 |  | 1735 |  |  | 1452 | $43 \cdot 13$ | 32．37 |  | 397 | 410 |  |  |  | 60 | 472 |  |  |
| 55 | 02 | 0115 | ＋019 | 9923 |  | 973 | 9634 | 9538 |  | 43.9346 | 32.9719 | 9847 | 9975 |  |  |  |  | 0615 |  |  | 55 |
| 56 | 8214 | 8117 | 8019 |  |  |  |  | 753 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 621 | 6119 | 60 | 59 | 58 |  |  |  | 542 | 45.53 | 34 |  |  |  | 2240 |  |  |  |  |  |  |
| 58 | 42 |  | 40 |  |  | 3716 | 3614 | 3513 | 3412 | 46.3310 | 34＇770 |  |  | 810 | 82 | 83 | 8514 |  |  |  |  |
| 59 | 22 |  | 2020 | 1917 | 1814 | 11 | 1508 | 1505 | 140 | $47 \cdot 129$ | $35 \cdot 36$ | 383 | 3973 | 4111 |  | 43 | 52 | 466 | 硣 |  |  |
| 60 | 023 | 0125 |  | 9916 | 98 | 9706 | 9601 | 9496 | 9391 | $47 \cdot 928$ | $35^{\circ}$ | 9833 | 9973 | 1113 |  |  |  | 6 | 0810 | 0950 |  |
| 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 |  | 413 | 402 | 391 | 380 | 369 | 358 | 3471 | 336 | 50．3251 | $37 \cdot 76$ |  | 797 | 81 | 82 |  |  | 矿 |  |  |  |
| 64 | 22 | 2133 | 202 |  |  | 168 |  | 1463 | 135 |  |  |  | 39 |  |  |  |  | 4715 |  |  |  |
| 65 | 02 |  |  |  |  |  |  |  |  | 51.922 | 38．9668 |  | 997 |  |  |  |  | 727 |  |  |  |
| 66 | 8253 |  |  |  |  |  |  |  |  |  | $39 \cdot 56$ |  |  |  |  |  |  |  |  |  |  |
| 67 | 625 | 6140 | 602 | 59 |  | 5672 |  | 543 |  | ．52 | $40 \cdot 16$ | 18 |  |  |  |  |  |  |  |  |  |
| 68 | 42 | 414 |  |  |  |  |  | 342 |  |  |  | 781 |  |  |  |  |  |  |  |  |  |
| 69 |  |  |  |  |  |  |  |  | 1300 |  | 41.3 |  | 39 |  | 42 | 445 |  | 477 |  |  |  |
| 70 | 026 | 0146 | ． 02 | 9902 | 9779 | 9657 | 9535 | 9412 | 9290 | 55.916 | 41.9643 | 9805 | 996 | 131 | 029 | 045 | 0620 | 0783 |  | 11 |  |
| 71 | 82 | 81 | 80 |  |  |  |  | 7404 | 7280 |  | 42.56 |  |  |  |  |  |  |  |  |  |  |
| 72 | 627 | 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 73 | 427 | 4152 | 402 | 389 | 3770 | 36 | 3515 | 3387 | 3259 | 58．31 | 43.762 | 779 | 796 | 813 |  | 84 | 8646 | 881 | 898 | 矿 |  |
| 74 | 22 | 2154 | 202 | 189 |  | 硣 | 1508 |  |  |  | $44 \cdot 36$ | 3794 | 396 | 413 | 431 | 4483 | 65 | 827 |  |  |  |
| 75 | 02 | 0156 |  |  | 9764 |  |  | 3370 |  | 59．9108 | 44.96 | 979 | 996 |  | 031 | 析 | 66 | 83 | 1013 |  |  |
| 76 | 82 |  |  |  |  |  |  |  |  |  |  |  | 矿 | ， | 631 | 206 | 6 | 885 | 碦 |  |  |
| 77 | 6295 | 6160 | 602 | 589 | 5757 | 56 | 5488 | 535 | 521 | $61 \cdot 50$ | $46 \cdot 16$ |  | 196 | 21 | 23 | 2503 | 2682 | 2861 | 30 | 32 |  |
| 78 | 429 | 41 | 2027 | 矿 | 3754 | 618 | 481 | 3345 | 120 | －30 | 4676 | 7783 | 796 |  | 832 | 516 | 析 | d |  |  |  |
| 79 | 2302 | 2165 |  | 1889 | 1751 | 1613 | 1475 | 1337 | 1199 | $63^{\prime} 10$ | 47.35 | 3780 | 3964 | 414 | 433 | 4516 | 469 | 488 | 506 | 52 |  |
| 80 | 0306 | 0167 | －02 | 9887 | 9748 | 9608 | 9468 | 9328 | 9188 | $63 \cdot 9048$ | $47 \cdot 9591$ | 977 | 96 | －15 | 033 | 052 | 070 | 089 | 1080 | 12 |  |
| 81 | 83 | 81 | 8027 | 7886 |  |  | 7462 | 7320 | 1788 |  |  | 575 | 5963 |  |  |  |  |  |  |  |  |
| 82 |  | 6171 | 6028 |  | 1848 |  | 5455 | 硣 | 5168 | 65．5025 | $49 \cdot 15$ | 7789 | 7963 | 位 | 234 | 25 | 272 | 29 |  |  |  |
| 83 | 4318 | 4173 | 4028 | 3883 | 3738 | 35 | 3448 | 3303 | 3158 | 66.301 | 49757 | 776 | 7963 | 81 | 83 | 8542 | 8735 | 892 | 912 |  |  |
| 84 | 23 | 17 | 2028 | 82 | 1735 | 源 | 1442 | 28 | 1148 | $67 \cdot 100$ | 50．35 | 3767 | 3962 | 415 | 435 | 454 | 474 | 493 | 位 |  |  |
| 85 | 0325 | 0177 |  |  |  |  |  |  |  |  | 50.95 | 976 | 9962 | ＋159 |  | 055 | 075 | 95 | 14 | 134 |  |
| 86 | 8329 |  |  |  |  |  | 7428 | 278 | 18189 |  |  | 5761 | 596 | 67 | 63 | 6561 | 6761 | 696 | 716 |  |  |
| 87 | 6333 | 6181 | 602 | 587 | 5726 | 5574 | 5422 | 5270 | 5117 | 69＊496 | $52 \cdot 15$ | 175 | 196 | 21 | 23 | 2568 | 2770 | 297 | 317 |  |  |
| 88 | 4337 | 4183 |  | 8876 |  |  | ， | 226 | 1107 | 70．2953 |  | 7755 | 7960 | 816 | 8370 | 857 | 8779 | 898 | 188 |  |  |
| 89 | 2341 | 2185 | 2030 | 1875 | 1719 | 1564 | 1408 | 1253 | 1097 | 71.094 | 53.3545 | 3753 | 3960 | 416 | 4374 | 458 | 4788 | 499 | 520 | 54 |  |
| 90 | 034 | 018 | －030 | 9873 | 9716 | 955 | 9402 | 9244 | 9087 | 71－8929 | 53.9540 | 9750 | 995 | 1 | 0378 | 0588 | 0797 | 100 | 121 | 142 |  |
|  | 83 | 8190 |  |  | 7713 |  |  | 7236 |  |  |  | 5747 | 5959 |  | 638 |  |  | 7017 |  |  |  |
|  | 6352 | 6192 | 6031 | sol | S710 | 554 | 矿 | 5228 | 5067 | 73.4 | 55．153 | 174 | 195 | 2173 | 238 | 26 | 2815 | 302 | 3242 |  |  |
| 93 | 4356 | 4194 | 4031 | 3869 | 3707 | 3544 | 338 | 3219 | 3057 | 74.289 | 55.7525 | 774 | 795 | 8174 | 839 | 8607 | 8823 | 904 | 925 | 947 |  |
| 94 | 236 | 2196 | 32 | 68 | 04 | 1539 | 1375 | 1211 | 1046 | ．0882 | 56.3520 | 3739 | 3958 | 417 | 439 | 㕍 | 4832 | 505 | 26 |  |  |
| 95 | 03 |  |  |  |  | 9535 | 9368 | 9202 |  | －8870 | 56.9515 | 9736 | 9957 | 1178 | 039 | 062 | 084 | 1062 | 1283 | 158 |  |
|  | 8367 | 8200 | 32 | 7865 | 7697 | 7530 | 362 | 194 | 26 | 6.685 | 57．5510 | 5733 | 5957 | 6180 | 64 | 627 | 850 | 7073 | 7296 | 7519 |  |
| 97 | 6371 | 6202 | 6033 | 5864 | 5694 | 5525 | 5355 | 5186 | 5016 | $77 \cdot 4846$ | 58.1505 | 1730 | 1956 | 2182 | 2408 | 2633 | 285 | 08 |  |  |  |
|  | 4375 | 04 | 4033 | ${ }^{3862}$ | 1688 | S5 | 3348 | 1178 | 3006 | 78．2834 | 58.7500 |  | 7956 | 8118 | 84 | 8640 | 8868 | 9096 | 9323 |  |  |
|  | 2379 |  | 2033 | 1861 | 1688 | 1515 | 1342 | 1169 | 0996 | 79.082 | 59.3494 | 372 | 395 | 418 | 4416 | 4646 | 4877 | 5107 | 5337 | 556 |  |
| 100 | 0383 | 208 | 034 | 85 | 685 | 510 | 9335 | 160 | 8986 | 79．881 | 59.948 | 9722 | 9955 | 18 | 0420 | 65 | 0885 | 1118 | 1350 | 1583 | 100 |
|  |  |  |  | $7{ }^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ |  | $10^{\prime}$ |  |  |  | $6^{\prime}$ | $5^{\prime}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | SINE |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.

| 37 | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $37^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11^{\prime}$ | $12{ }^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ | $17^{\prime}$ | 18 | $19^{\prime}$ | 10 | 11 | $12{ }^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | 15 | $16^{\prime}$ | $17^{\prime}$ | 18 | $19^{\prime}$ |  |
|  | 7969 | 7967 | 7965 | 7964 | 7962 | 7960 | 7958 | 7956 | 7955 | 953 | 641 | 6044 | 6046 | 6048 | 6051 | 6053 | 6055 | 058 | 6060 | 62 |  |
|  | 5938 | 5934 | 5931 | 5927 | 5924 | 5920 | 5917 | 5913 | 5909 | $1 \cdot 5906$ | $1 \cdot 2083$ | 2087 | 2092 | 2097 | 2101 | 2106 | 2111 | 2115 | 2120 | 2124 |  |
| 3 | 3906 | 3901 | 3896 | 3891 | 3885 | 3880 | 3875 | 3869 | 3864 | $2 \cdot 3859$ | $1 \cdot 8124$ | 8131 | 8138 | 8145 | 8152 | 8159 | 8166 | 8173 | 8180 | 8187 |  |
| 4 | 1875 | 1868 | 1861 | 1854 | 1847 | 1840 | 1833 | 1826 | 1819 | $3 \cdot 1812$ | 2.4165 | 4175 | 4184 | 4193 | 4202 | 4212 | 422 | 4230 | 4240 | 4249 |  |
| 5 | 9844 | 9835 | 9826 | 9818 | 9809 | 9800 | 9791 | 9782 | 9774 | 3.9765 | 3.0207 | 021 | 0230 | 0242 | 0253 | 0265 | 0276 | 0288 | 029 | 0311 | 5 |
| 6 | 7813 | 7802 | 7792 | 7781 | 7771 | 7760 | 7750 | 7739 | 772 | 4.7718 | 3.6248 | 6262 | 6276 | 6290 | 6304 | 6318 | 6332 | 6345 | 6359 | 6373 | 6 |
| 7 | 5782 | 5769 | 5757 | 5745 | 5732 | 5720 | 5708 | 5695 | 5683 | 5.5671 | 4.2289 | 2306 | 2322 | 2338 | 2354 | 2371 | 2387 | 2403 | 2419 | 2435 |  |
| 8 | 3751 | 3736 | 3722 | 3708 | 3694 | 3680 | 3666 | 3652 | 3638 | 6'3624 | 4.8331 | 8349 | 8368 | 8386 | 8405 | 8424 | 8442 | 8461 | 8479 | 8498 |  |
|  | 1719 | 1704 | 1688 | 1672 | 1656 | 1640 | 1624 | 1608 | 1593 | $7 \cdot 1577$ | 5.4372 | 4393 | 4414 | 4435 | 4456 | 4476 | 4497 | 4518 | 4539 | 4560 |  |
| 10 | 9688 | 9671 | 653 | 35 | 9618 | 9600 | 9583 | 9565 | 9547 | 7.9530 | 6.0414 | 0437 | 0460 | 0483 | 0506 | 0529 | 0553 | 0576 | 0599 | 622 | 10 |
| 11 | 7657 | 7638 | 7618 | 7599 | 7580 | 7560 | 7541 | 7521 | 7502 | 8.7483 | 6.6455 | 6480 | 6506 | 6531 | 655 | 6582 | 6608 | 663 | 665 | 6684 | 11 |
| 12 | 5626 | 5605 | 5584 | 5562 | 5541 | 5520 | 5499 | 5478 | 5457 | 9.5436 | 7.2496 | 2524 | 2552 | 2580 | 2607 | 2635 | 2663 | 2691 | 2719 | 2746 | 12 |
| 13 | 3595 | 3572 | 3549 | 3526 | 3503 | 3480 | 3457 | 3434 | 3412 | 10.3389 | 7.8538 | 8568 | 8598 | 8628 | 8658 | 8688 | 8718 | 8748 | 8778 | 8809 | 13 |
| 14 | 1563 | 1539 | 1514 | 14 | 146 | 144 | 1416 | 1391 | 1366 | $11 \cdot 1342$ | 8.4579 | 4611 | 4644 | 4676 | 4709 | 4741 | 4774 | 4806 | 4838 | 4871 | 14 |
| 15 | 9532 | 9506 | 9479 | 9453 | 9427 | 9400 | 9374 | 9347 | 9321 | 11.9295 | 9.0620 | 0655 | 0690 | 0725 | 0759 | 0794 | 0829 | 0864 | 0898 | 0933 | 15 |
| 16 | 7501 | 74 | 7445 | 74 | 73 | 7360 | 7332 | 7304 | 72 | 12.7248 | 9.6662 | 6699 | 6736 | 6773 | 6810 | 6847 | 6884 | 6921 | 88 | 6995 | 16 |
| 17 | 5470 | 5440 | 5410 | 5380 | 5350 | 5320 | 5290 | 5260 | 5230 | 13.5201 | 10.2703 | 2742 | 2782 | 2821 | 2861 | 2900 | 2939 | 2979 | 3018 | 3057 | 17 |
| 18 | 3439 | 3407 | 3375 | 3344 | 3312 | 3280 | 3249 | 3217 | 3185 | 14.3153 | 10.8744 | 8786 | 8828 | 8870 | 8911 | 8953 | 8995 | 9036 | 90 | 9120 | 18 |
| 19 | 1407 | 1374 | 1341 | 1307 | 1274 | 1240 | 1207 | 1173 | 1140 | 15\%106 | 114786 | 4830 | 4874 | 4918 | 4962 | 5006 | 5050 | 5094 | 5138 | 5182 | 19 |
| 20 | 9376 | 9341 | 9306 | 9271 | 9236 | 9200 | 9165 | 9130 | 9095 | 15.9059 | 12.0827 | 0873 | 0920 | 0966 | 1012 | 1059 | 1105 | 115 | 1198 | 1244 | 20 |
| 21 | 7345 | 7308 | 7271 | 7234 | 7197 | 7160 | 7123 | 7086 | 704 | 16.7012 | 12.6868 | 6917 | 6966 | 7014 | 7063 | 7112 | 7160 | 720 | 725 | 7306 | 21 |
| 22 | 5314 | 5275 | 5237 | 5198 | 5159 | 5120 | 5082 | 5043 | 5004 | 17.4965 | 13.2910 | 2961 | 3012 | 3063 | 3114 | 3165 | 3216 | 3267 | 3317 | 33 | 22 |
| 23 | 3283 | 3242 | 3202 | 3161 | 3121 | 3080 | 3040 | 2999 | 2959 | 18.2918 | 13.8951 | 9005 | 9058 | 9111 | 9164 | 9218 | 9271 | 9324 | 9377 | 9431 | 23 |
| 24 | 1252 | 1209 | 1167 | 1125 | 1083 | 1040 | 0998 | 0956 | 0914 | $19 \cdot 0871$ | 14.4993 | 5048 | 5104 | 5159 | 5215 | 5271 | 5326 | 5382 | 5437 | 54 | 24 |
| 25 | 9220 | 9176 |  |  |  |  | 56 | 8912 | 8868 | 19.8824 | 15.1034 | 1092 | 1150 | 1208 | 1266 | 1324 | 1381 | 143 | 149 | 1555 | 25 |
| 26 | 7189 | 44 | 7098 | 7052 | 7006 | 696 | 6915 | 6869 | 6823 | 20.6777 | $15 \cdot 7075$ | 7136 | 7196 | 7256 | 7316 | 7376 | 7437 | 7497 | 75 | 7617 | 26 |
| 27 | 5158 | 5111 | 5063 | 5016 | 4968 | 4921 | 4873 | 4825 | 4778 | $21 \cdot 4730$ | 16.3117 | 3179 | 3242 | 3304 | 3367 | 3429 | 3492 | 3554 | 3617 | 3679 | 27 |
| 28 | 3127 | 3078 | 3028 | 2979 | 2930 | 2881 | 2831 | 2782 | 2733 | 22.2683 | 16.9158 | 9223 | 9288 | 9353 | 9417 | 9482 | 9547 | 9612 | 9677 | 9742 | 28 |
| 29 | 1096 |  |  | 0943 |  | 0841 |  | 0738 | 0687 | 23.0636 | $17 \cdot 5199$ | 5267 | 5334 | 5401 | 5468 | 5535 | 5602 | 5670 | 5737 | 580 | 29 |
| 30 | 9064 | 9012 | 895 | 8906 | 885 | 8801 | 8748 | 8695 | 18642 | $23 \cdot 8589$ | 18.1241 | 1310 | 138 | 1449 | 1519 | 1588 | 165 | 172 | 179 | 186 | 30 |
| 31 | 7033 | 6979 | 6924 | 6870 | 681 | 676 | 06 | 651 | 6597 | $24 \cdot 65$ | $18 \cdot 72$ | 7354 | 7426 | 7498 | 7569 | 7641 | 7713 | 7785 | 7856 | 7928 | 31 |
| 32 | 5002 | 4946 | 4890 | 4833 | 4777 | 4721 | 4664 | 4608 | 4552 | 25.4495 | 19.3323 | 3398 | 3472 | 3546 | 3620 | 3694 | 3768 | 3842 | 3916 | 3990 | 32 |
| 33 | 2971 | 2913 | 2855 | 2797 | 2739 | 2681 | 2623 | 2564 | 2506 | $26 \cdot 2448$ | 19.9365 | 944] | 9518 | 9594 | 9671 | 9747 | 9823 | 9900 | 9976 | +053 | 33 |
| 34 | 0940 | 0880 | 0820 | 0760 | 0701 | 0641 | 0581 | 0521 | 0461 | 27.0401 | 20.5406 | 5485 | 5564 | 5642 | 5721 | 5800 | 5879 | 5957 | 6036 | 6115 | 34 |
| 35 | 8909 | 8847 | 8785 | 8724 | 8662 | 8601 | 8539 | 8477 | 8416 | 27-8354 | $21 \cdot 1447$ | 1529 | 1610 | 1691 | 1772 | 1853 | 1934 | 201 | 2096 | 217 | 35 |
| 36 | 6877 | 6814 | 6751 | 6687 | 6624 | 6561 | 6497 | 6434 | 6370 | $28 \cdot 6307$ | 21.7489 | 757 | 7656 | 7739 | 7822 | 7906 | 7989 | 8073 | 8156 | 8239 | 36 |
| 37 | 4846 | 4781 | 4716 | 4651 | 4586 | 4521 | 4456 | 4390 | 4325 | 29.426 | 22.3530 | 3616 | 3702 | 3787 | 3873 | 3959 | 4044 | 4130 | 4216 | 4301 | 37 |
| 38 | 2815 | 2748 | 2681 | 2615 | 2548 | 2481 | 2414 | 2347 | 2280 | 30. 2213 | $22 \cdot 9572$ | 9660 | 9748 | 9836 | 9924 | -012 | 0100 | 018 | 0276 | 03 | 38 |
| 39 | 0784 | 0715 | 0647 | 0578 | 0509 | 0441 | 0372 | 0303 | 0235 | 31.0166 | 23.56 | 5703 | 5794 | 5884 | 5974 | 6065 | 6155 | 6245 | 6335 | 642 | 39 |
| 40 | 8753 | 8682 | 8612 | 8542 | 8471 | 8401 | 8330 | 8260 | 8189 | 31.8119 | $24 \cdot 1654$ | 1747 | 1840 | 1932 | 2025 | 2118 | 2210 | 2303 | 2395 | 248 | 40 |
| 41 | 6721 | 6649 | 65 | 65 | 643 | 636 | 89 | 16 | 6144 | 32 | 24 | 7791 | 78 | 79 | 80 | 8171 | 8265 | 8360 | 8455 | 8550 | 41 |
| 42 | 4690 | 4616 | 4543 | 4469 | 4395 | 4321 | 4247 | 4173 | 4099 | 33.4025 | $25 \cdot 3737$ | 3834 | 3932 | 4029 | 4126 | 4223 | 4321 | 4418 | 45 | 4612 | 42 |
| 43 | 2659 | 2583 | 2508 | 2432 | 2357 | 2281 | 2205 | 2129 | 2054 | 34.1978 | 25.9778 | 9878 | 9978 | -077 | 0177 | 0276 | 0376 | 0476 | 0575 | 06 | 43 |
| 44 | 0628 | 0551 | 0473 | 0396 | 0318 | 0241 | 0163 | 0086 | -008 | 34.9931 | 26.5820 | 5922 | 6024 | 6126 | 6227 | 6329 | 6431 | 6533 | 6635 | 6737 | 44 |
| 45 | 8597 | 18 | 8438 | 8359 | 8280 | 8201 | 8122 | 8042 | 79 | 35.7884 | $27 \cdot 1861$ | 1965 | 2070 | 2174 | 227 | 238 | 248 | 25 | 2695 | 2792 | 45 |
| 46 | 6565 | 6485 | 6404 | 6323 | 6242 | 6161 | 6080 | 5999 | 5918 | 36.5837 | $27 \cdot 7902$ | 8009 | 8116 | 8222 | 8329 | 8435 | 8542 | 8648 | 8755 | 886 | 46 |
| 47 | 4534 | 4452 | 4369 | 4286 | 4204 | 4121 | 4038 | 3955 | 3873 | 37-3790 | 28.3944 | 4053 | 4162 | 4270 | 4379 | 4488 | 4597 | 4706 | 4815 | 49 | 47 |
| 48 | 2503 | 2419 | 2334 | 2250 | 2165 | 2081 | 1996 | 1912 | 1827 | 38.1743 | 28.9985 | 1096 | 0208 | 0319 | 0430 | 0541 | 0652 | 0763 | 0874 | 098 | 48 |
| 49 | 0472 | 0386 |  | 0213 | 012 | +041 | 9955 | 9868 | 9782 | 38.9696 | $29 \cdot 6026$ | 614 | 6254 | 6367 | 648 | 6594 | 6707 | 6821 | 6934 | 7048 | 49 |
| 50 | 8441 | 8353 | 8265 | 8177 | 8089 | 8001 | 7913 | 7825 | 7737 | $39 \cdot 7649$ | 30.2068 | 2184 | 2300 | 2415 | 2531 | 2647 | 2763 | 2879 | 2994 | 3110 | 50 |
| 51 | 641 | 20 | 230 | 6141 | 605 | 59 | 71 | 5781 | 5691 | $40^{\circ}$ | 30 | 8227 | 83 | 8464 | 8582 | 8700 | 8818 | 89 | 9054 | 9172 | 51 |
| 52 | 4378 | 4287 | 4196 | 4104 | 4013 | 3921 | 3829 | 3738 | 3646 | 41.3555 | 31.4151 | 4271 | 4392 | 4512 | 4632 | 4753 | 4873 | 4994 | 5114 | 523 | 52 |
| 53 | 2347 | 2254 | 2161 | 2068 | 1974 | 1881 | 1788 | 1694 | 1601 | $42 \cdot 1508$ | 32.0192 | 0315 | 0438 | 0560 | 0683 | 0806 | 0929 | 1051 | 1174 | 1328 | 53 |
| 54 | 0316 | 0221 | 0126 | -031 | 9936 | 9841 | 9746 | 9651 | 9556 | 42.9460 | $32 \cdot 6233$ | 6358 | 6484 | 6609 | 6734 | 6859 | 6984 | 7109 | 72 | 7359 | 54 |
| 55 | 8285 | 8188 | 8091 | 7995 | 7898 | 7801 | 7704 | 7607 | 7510 | 43.7413 | 33.2275 | 2402 | 2530 | 2657 | 278 | 291 | 303 | 3166 | 3294 | 3421 | 55 |
| 56 | 6254 | 6155 | 6057 | 5958 | 5860 | 5761 | 5663 | 5564 | 5465 | 44.5366 | $33^{\prime} 8316$ | 8446 | 8575 | 8705 | 8835 | 8965 | 9094 | 9224 | 9354 | 9483 | 56 |
| 57 | 4222 | 4122 | 4022 | 3922 | 3821 | 3721 | 3621 | 3520 | 3420 | 45.3319 | 34:4357 | 4489 | 4621 | 4754 | 4886 | 5018 | 5150 | 5281 | 5413 | 554 | 57 |
| 58 | 2191 | 2089 | 1987 | 1885 | 1783 | 1681 | 1579 | 1477 | 1375 | $46 \cdot 1272$ | $35^{\circ} 0399$ | 0.533 | 0667 | 0802 | 0936 | 1071 | 1205 | 1339 | 1473 | 1607 | 58 |
| 59 | 01 | -056 | 9953 | 9849 | 9745 | 9641 | 9537 | 9433 | 9329 | 46.9225 | $35 \cdot 6440$ | 657 | 6713 | 6850 | 69 | 7123 | 7260 | 7397 | 7533 |  | 59 |
| 60 | 8129 | 8023 | 7918 | 7812 | 7707 | 7601 | 7496 | 7390 | 7284 | $47 \cdot 7178$ | 36.2481 | 2620 | 2759 | 2898 | 3037 | 3176 | 331 | 3454 | 3593 | 3732 | 60 |
| 61 | 6098 | 5991 | 588 | 577 | 56 | 5561 | 454 | 346 | 5239 | $48^{\circ} 5131$ | 36.8523 | 8664 | 8805 | 8947 | 9088 | 9229 | 9371 | 95 | 9653 |  |  |
| 62 | 4067 | 3958 | 3849 | 3739 | 3630 | 3521 | 3412 | 3303 | 3194 | 49.3084 | 37-4564 | 4708 | 4851 | 4995 | 5139 | 5282 | 5426 | 5569 | 5713 | 5856 | 62 |
| 63 | 2035 | 1925 | 1814 | 1703 | 1592 | 1481 | 1370 | 1259 | 1148 | 50•1037 | $38 \cdot 0605$ | 0751 | 0897 | 1043 | 1189 | 1335 | 1481 | 1627 | 1773 | 191 | 63 |
| 64 | 4004 | 9892 | 9779 | 9667 | 9554 | 9441 | 9329 | 9216 | 9103 | 50•8990 | 38.6647 | 6795 | 6943 | 7092 | 7240 | 7388 | 7536 | 7684 | 7833 | 798 | 64 |
| 65 | 7973 | 859 | 7744 | 763 | 7516 | 7401 | 7287 | 7172 | 7058 | 51.6943 | $39 \cdot 2688$ | 2839 | 2989 | 3140 | 329 | 344 | 359 | 3742 | 3892 | 4043 | 65 |
| 66 | 5942 | 5826 | 5710 | 5594 | 5477 | 5361 | 5245 | 5129 | 5013 | 52.4896 | 39•8729 | 8882 | 9035 | 9188 | 9341 | 9494 | 9647 | 9800 | 9952 | +105 | 66 |
| 67 | 3911 | 3793 | 3675 | 3557 | 3439 | 3321 | 3203 | 3085 | 2967 | 53.2849 | 40.4771 | 4926 | 5081 | 5237 | 5392 | 5547 | 5702 | 5857 | 6012 | 61 | 67 |
| 68 | 1879 | 1760 | 1640 | 1521 | 1401 | 1281 | 1162 | 1042 | 0922 | 54.0802 | $41^{\circ} 0812$ | 0970 | 1127 | 1285 | 1442 | 1600 | 1757 | 1915 | 2072 | 222 | 68 |
| 69 | 9848 | 9727 | 9606 | 9484 | 9363 | 9241 | 9120 | 998 | 8877 | 54.8755 | 41.6854 | 7014 | 7173 | 7333 | 7493 | 7653 | 7813 | 7972 | 8132 | 8292 | 69 |
| 70 | 7817 | 7694 | 7571 | 7448 | 7325 | 7201 | 7078 | 6955 | 6831 | $55^{\circ} 6708$ | 42.2895 | 3057 | 3219 | 3382 | 3544 | 3706 | 3868 | 4030 | 4192 | 435 | 70 |
| 71 | 5786 | 5661 | 5536 | 5411 | 5286 | 5161 | 5036 | 4911 | 4786 | 56.4661 | 42.8936 | 9101 | 9265 | 9430 | 9594 | 9759 | 9923 | 1087 | 0252 |  | 71 |
| 72 | 3755 | 3628 | 3502 | 3375 | 3248 | 3121 | 2995 | 2868 | 2741 | 57-2614 | $43 \times 4978$ | 5145 | 5311 | 5478 | 5645 | 5812 | 5978 | 6145 | 6312 | 6478 | 72 |
| 73 | 1723 | 1595 | 1467 | 1338 | 1210 | 1081 | 0953 | 0824 | 0696 | 58.0567 | 44.1019 | 1188 | 1357 | 1526 | 1696 | 1865 | 2034 | 2203 | 2372 | 2540 | 73 |
| 74 | 9692 | 9562 | 9432 | 9302 | 9172 | 9041 | 8911 | 8781 | 8650 | 58.8520 | 44.7060 | 7232 | 7403 | 7575 | 7746 | 7918 | 8089 | 8260 | 8431 | 8603 | 74 |
| 75 | 7661 | 7529 | 7397 | 7266 | 7134 | 7002 | 6869 | 6737 | 6605 | 59.6473 | 45.3102 | 3276 | 3449 | 3623 | 3797 | 3971 | 4144 | 4318 | 4491 | 466 | 75 |
| 76 | 5630 | 5496 | 5363 | 5229 | 5095 | 4962 | 4828 | \|4694 | 4560 | 60*4426 | 45.9143 | 9319 | 9495 | 9671 | 9847 | ${ }^{*} 023$ | 0199 | 0375 | 0551 | 072 | 76 |
| 7 | 3599 | 3463 | 3328 | 3193 | 3057 | 2922 | 2786 | 2650 | 2515 | $61 \cdot 2379$ | 46.5184 | 5363 | 5541 | 5720 | 5898 | 6076 | 6255 | 6433 | 6611 | 678 | 77 |
| 78 | 1568 | 1431 | 1293 | 1156 | 1019 | 0882 | 0744 | 0607 | 0469 | 62.0332 | 47-1226 | 1407 | 1587 | 1768 | 1949 | 2129 | 2310 | 2490 | 2671 | 285 | 78 |
| 79 | 9536 | 9398 | 9259 | 9120 | 8981 | 8842 | 8702 | 8563 | 8424 | 62.8285 | $47 \cdot 7267$ | 7450 | 7633 | 7816 | 7999 | 8182 | 8365 | 8548 | 8731 | 891 | 79 |
| 80 | 7505 | 7365 | 7224 | 7083. | 6942 | 6802 | 6661 | 6520 | 6379 | 63.6238 | $48 \cdot 3308$ | 3494 | 3679 | 3865 | 4050 | 4235 | 442 | 4606 | 4791 | 4976 | 80 |
| 81 | 5474 | 5332 | 5189 | 5047 | 4904 | 4762 | 4619 | 4476 | 4334 | 64'4191 | $48^{\circ} 9350$ | 9538 | 9725 | 9913 | 101 | 0288 | 0476 | 0663 | 0851 | 103 | 81 |
| 82 | 3443 | 3299 | 3155 | 3010 | 2866 | 2722 | 2577 | 2433 | 2288 | 65.2144 | 49.5391 | 5581 | 5771 | 5961 | 6151 | 6341 | 6531 | 6721 | 6910 | 7100 | 82 |
| 83 | 1412 | 1266 | 120 | 973 | 0828 | 0682 | 0535 | 0389 | 0243 | 66.0097 | 50.1433 | 1625 | 1817 | 2010 | 2202 | 2394 | 2586 | 2778 | 2970 | 3162 | 83 |
| 84 | 9380 | 9233 | 9085 | 8937 | 8790 | 8642 | 8494 | 8346 | 8198 | 66.8050 | 50.7474 | 7669 | 7863 | 8058 | 8252 | 844 | 8641 | 8836 | 9030 | 9225 | 84 |
| 85 | 734 | 7200 | 7050 | 6901 | 6751 | 652 | 6452 | 6302 | 6152 | 67.6003 | 51.3515 | 3712 | 3909 | 4106 | 4303 | 450 | 469 | 489 | 5090 | 5287 | 85 |
| 86 | 5318 | 5167 | 5016 | 4864 | 4713 | 4562 | 4410 | 4259 | 4107 | 68.3956 | 51.9557 | 9756 | 9955 | +154 | 0354 | 0553 | 0752 | 0951 | 1150 | 134 | 86 |
| 8 | 3287 | 3134 | 2981 | 2828 | 2675 | 2522 | 2369 | 2215 | 2062 | 69.1909 | 52.5598 | 5800 | 6001 | 6203 | 6404 | 6606 | 6807 | 7009 | 7210 | 7411 | 87 |
| 88 | 1256 | 1101 | 0946 | 0792 | 0637 | 0482 | 0327 | 0172 | +017 | 69.9862 | 53.1639 | 1843 | 2047 | 2251 | 2455 | 2659 | 2862 | 3066 | 3270 | 3473 | 88 |
| 89 | 9225 | 9068 | 8912 | 8755 | 598 | 8442 | 8285 | 8128 | 7971 | $70 \cdot 7815$ | 53.7681 | 7887 | 8093 | 8299 | 8506 | 8712 | 8918 | 9124 | 9330 | 953 | 89 |
| 90 | 7193 | 7035 | 6877 | 6719 | 6560 | 6402 | 6243 | 6085 | 5926 | 71.5767 | 54.3722 | 3931 | 4139 | 4348 | 4556 | 4765 | 4973 | 5181 | 5390 | 5598 | 90 |
| 91 | 5162 | 5002 | 4842 | 4682 | 4522 | 4362 | 4202 | 4041 | 3881 | 72.3720 | 54.9763 | \|974 | +185 | 0396 | 0607 | 0818 | 1028 | 1239 | 1449 | 166 | 91 |
| 92 | 3131 | 2969 | 2808 | 2646 | 2484 | 2322 | 2160 | 1998 | 1836 | $73^{\prime} 1673$ | 55.5805 | 6018 | 6231 | 6444 | 6657 | 6870 | 7083 | 7296 | 7509 | 772 | 92 |
| 93 | 110 | 0936 | 0773 | 0609 | 0446 | 0282 | +188 | 9954 | 9790 | 73.9626 | 56.1846 | 2062 | 2277 | 2493 | 2758 | 2923 | 3139 | 3354 | 源 | 378 | 93 |
| 94 | 9069 | 8903 | 8738 | 8573 | 8407 | 8242 | 8076 | 7911 | 7745 | 74.7579 | 56.7887 | 8105 | 8323 | 8541 | 8759 | 8976 | 9194 | 9412 | 9629 | 984 | 94 |
| 95 | 7037 | ¢81 | 03 | 16536 | 6369 | 6202 | 6035 | 5867 | 5700 | 75.5532 | 57-3929 | 4149 | 436 | 458 | 4809 | 502 | 524 | 546 | 568 | 5909 | 95 |
| 96 | 5006 | 4838 | 4669 | 4500 | 4331 | 4162 | 3993 | 3824 | 3655 | 76.3485 | 57.9970 | -193 | 0415 | 0638 | 0860 | 1082 | 1304 | 1527 | 1749 | 197 | 96 |
| 97 | 2975 | 2805 | 2634 | 2463 | 2293 | 2122 | 1951 | 1780 | 1609 | 77-1438 | $58 \cdot 6012$ | 6236 | 6461 | 6686 | 6911 | 7135 | 73 | 7584 | 7809 | 8033 | 97 |
| 98 | 0944 | 0772 | 0599 | 427 | 0254 | -082 | 9909 | 9737 | 9564 | 77-9391 | 59.2053 | 2280 | 2507 | 2734 | 2961 | 3188 | 3415 | 3642 | 3869 | 4095 | 98 |
|  | 8913 | 8739 | 565 | 90 | 8216 | 8042 | 7868 | 7693 | 7519 | 78.7344 | 59.8094 | 8324 | 8553 | 8782 | 9012 | 9241 | 9470 | 9699 | 9929 | 15 | 99 |
| 100 | 6882 | 6706 | 6530 | 6354 | 6178 | 6002 | 5826 | 5650 | 5474 | 79.5297 | $60 \cdot 4136$ | 4367 | 4599 | 4831 | 5062 | 5294 | 5526 | 5757 | 5988 | 6220 | 100 |
|  | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | $46^{\prime}$ | 45' | $44^{\prime}$ | $43^{\prime}$ | 42 | $41^{\prime}$ | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | $46^{\prime}$ | 45 | $44^{\prime}$ | $43^{\prime}$ | 42 | $41^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | S | INE. |  |  |  |  | $52^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

| $37^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $37^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | $52^{\prime}$ | 53 | $54^{\prime}$ | $55^{\prime}$ | 56 | 57 | 58 | 59 | 50 | 51 | 52 | 53 | 54 | $55^{\prime}$ | 56 | 57 | $58^{7}$ |  |  |
|  | 7898 | 789 | 789 | 7893 | 78 | 7889 | 7887 | 7885 | 7884 | 78 | 613 | 6136 | 6138 | 6141 | 614 | 6145 | 6147 | 6150 |  |  |  |
|  | 5796 | 5792 | 57 | 5785 | 5782 | 57 | 577 | 5771 | 57 | ． 576 | $\cdot 2267$ | 2272 | 227 | 228 | 22 | 2290 | ， | ¢ |  |  |  |
|  | 3694 | 368 | 3683 | 3678 | 3673 |  |  |  | 3651 |  |  | 840 | 8415 | 8422 | 84 | 8435 | 844 | 8449 | 8456 | 8463 |  |
|  | 159 | 1585 |  |  |  | 1556 |  |  |  | 3．152 | $2 \cdot 453$ | 4544 |  | 4562 | 4571 | 458 | 4590 | 45 | 4608 | 4617 |  |
|  | 949 |  |  |  |  |  |  |  |  |  |  |  | 0691 | 0703 |  | 0726 |  | 0749 | 760 | 77 |  |
|  | 73 | 7377 | 7366 |  | 7345 | 7334 | 7324 | 7313 | 7302 | 4729 | 3．6802 | 6816 | 6830 | 6843 | 8857 | 6871 | 6885 | 6898 | 6912 |  |  |
|  | 5286 | 527 | 52 | 5 | 5 | 52 |  |  | sta |  | 29 | 2952 | 296 | 2984 | 3000 | 30 | 30 | 3048 |  | 308 |  |
|  | 3184 | 3170 |  | 31 | 3 | 3112 |  |  | 3070 |  | －906 |  | 9106 | 9124 | 9123 | 916 |  |  | 16 | 23 |  |
|  | 1082 | 1066 |  |  | 1018 | 1001 | 0985 | 096 | 0953 |  |  |  | 5244 | 5265 | 528 | 5306 |  |  | 5368 | 5389 |  |
| 1 | 8980 | 8962 | 8944 | 8926 | 8908 | 8891 | 8873 | 8855 | 8837 | 7.8819 | －1337 | 1360 | 1383 | 1406 | 1429 | 1451 | 1474 | 149 | 1520 | 54 | 10 |
| 11 | 6878 | 6858 | 683 | 6819 | 6799 | 678 | 67 | 6740 | 67 | 8.6701 | 6.7470 | 74 | 752 | 75 | 75 | 75 |  | 7647 | 7672 |  |  |
| 12 | 477 |  |  |  | 90 | 46 | 4647 |  |  |  |  | 3632 | 59 | 687 | 3714 | 374 | 3769 | 3797 | 3824 |  | 12 |
| 13 | 2674 | 2651 | 2627 | 26 | 2581 | 25 | 25 | 2511 | 2488 | 10. | 97 | 9768 | 97 | 9827 | 98 | 988 | 99 | 99 |  | ＋006 | 13 |
| 14 | 0572 | 0547 |  |  | 寿 | 0447 | 0422 |  |  | 1103 | － 587 |  | 5936 | 5968 | 60 | 603 | 606 | 609 | 28 |  | 14 |
| 15 | 84 |  |  | 8389 |  |  |  |  |  |  |  |  |  | 2108 |  |  |  | 2246 |  |  | 15 |
| 16 | 636 | 6339 | 6311 | 6282 | 6253 | 6225 | 6196 | 6168 | 6139 | 12.6110 | 9.8139 | 8175 |  | 224 | 286 | 8322 | 8359 | 8396 | 8432 |  | 16 |
| 17 | 426 | 42 | 420 | 4 | 4144 | 4114 | 408 | 1 | 4023 |  | 10. | 43 |  | 438 |  | 44 |  | 4546 | 4584 | 462 | 17 |
| 18 | 216 |  |  |  | 2035 |  |  |  |  | 14. | 11. |  | 0489 | 0530 | 0571 | 06 |  |  | 0737 | 0778 | 18 |
| 19 | 006 | －028 | 9994 | 9960 | 992 |  | 9858 | 9824 | 979 | 14.97 | 11.65 | 65 | 66 | 6671 | 6714 | 67 | 680 | 68 | 6889 | 693 | 19 |
| 20 | 79 | 7924 | 7888 | 7853 | 7817 |  |  | 7710 | 74 | 15.7638 | 12.267 | 27 | 2765 | 281 | 285 | 290 | 29 | 295 | 3041 | 308 | 20 |
| 21 | 58 |  |  |  |  |  |  |  |  |  | 12.8807 |  |  |  |  |  |  |  |  |  | 1 |
| 22 | 375 | 37 |  |  |  |  |  |  |  | 17．3402 |  |  |  |  |  |  |  |  |  |  | 22 |
| 23 | 165 | 161 | 157 | 1530 | 1489 | 1448 | 1407 | 1366 | 1325 | 18 | 14. | 1127 | 1180 | 12 | 128 | 13 | 13 | 1444 | 1497 | 1549 | 3 |
| 24 | 955 |  |  |  | 9380 | 9337 |  |  | 9209 |  | 14 |  | 73 | 737 |  | 74 | 7539 |  |  |  | 24 |
| 25 | 745 | 7405 | 736 | 7316 | 7271 | 226 | 7182 | 7137 | 7092 | 19 | 15 | 3399 | 3457 | 3514 | 357 | 362 | 368 | 3743 | 3801 | 385 | 25 |
| 26 | 534 | 5301 | 5255 | 5208 | 5162 | 5115 | 5069 | 5022 | 4976 | 20 | 15.947 | 9535 | 9595 | 9654 | 9714 | 9774 | 9833 | 9893 | 9953 | －012 | 26 |
| 27 | 32 |  |  |  |  |  |  |  |  | $21 \cdot 2811$ |  |  |  |  |  |  |  |  |  |  | 27 |
| 28 | 11 | 109 |  |  | 0944 | 08 | 084 |  |  | 22 | $17 \cdot 17$ |  |  |  |  |  | 21 |  |  | 23 | 28 |
| 29 | 9042 | 899 | 89 |  | 8834 |  |  |  |  | 22 | 17 | 7943 | 8010 | 807 | 81 |  | 82 |  | 8409 |  | 29 |
| 30 | 6939 | 6886 | 6832 | 6779 | 6725 | 6672 | 6618 | 6564 | 6511 | $23 \cdot 645$ | 18 | 4079 | 4148 | 4217 | 4286 | 43 | 4423 | 4492 | 4561 | 4630 | 30 |
| 31 | 483 |  |  |  |  |  |  |  |  |  | 19.014 |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 27 | 26 | 2621 | 2564 | 250 | 2450 | 239 | 233 | 2278 | ．22 | 19.62 | 63 |  |  | 6 |  |  |  |  |  | 32 |
| 33 | 06 | 057 | 0516 |  | 03 | 0339 |  |  | 0162 | ．010 | 20 | 24 | 2563 | 263 | 27 |  |  |  |  |  | 33 |
| 34 | 853 |  |  |  |  |  |  | 8106 |  |  |  |  | 870 | 877 |  |  | ， |  |  |  | 34 |
| 35 | 642 | 63 | 630 | 6242 | 6179 | 6117 | 605 | 5992 | 5929 | 27.5866 | 21. | 475 | 483 | 491 | 5000 | 508 | 51 | 52 | 532 | 54 | 35 |
| 36 | 43 | 4263 | 4199 | 4135 | 4070 | 4006 | 3942 | 3877 | 3813 | 28 | 22 | 0895 | 0977 | 1060 | 1143 | 1225 | 1308 | 1390 | 1473 | 155 | 36 |
| 37 | 22 |  |  |  |  |  |  |  | 169 | 29•1630 | $22 \cdot 69$ |  |  | 7201 |  |  |  |  |  |  | 37 |
| 38 | 01 | ＋056 |  |  | 9852 | 978 | 9716 | 9648 | 958 |  | $23 \cdot 30$ |  |  | 33 | 342 |  |  | 3690 | 3777 |  | 38 |
| 39 | 80 |  |  |  |  |  | 7603 |  |  | 30.73 |  |  |  | 948 |  |  |  | 9840 | 砣 |  | 39 |
| 40 | 5919 | 5848 | 5777 |  | 5634 | 5562 | 549 |  | 5348 | 31527 | 24 | 5439 | 5530 | 5622 | 5714 | 5806 | 5898 | 5989 | 6081 | 617 | 40 |
| 41 | 381 | 37 |  |  | 3526 |  |  |  |  |  | 25．1480 |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 171 | 16 | 156 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 96 | 953 |  | 9383 | 9306 | 9229 | 9152 | 90 | 899 | 3 | $26 \cdot 3748$ |  |  | 4044 |  | 4241 |  |  |  |  | 43 |
| 44 | 751 | 743 |  | 7276 |  |  | 70 | 696 |  |  |  | 9982 | －083 | 018 | 02 | 03 | 04 |  |  | 079 | 4 |
| 45 | 5409 | 5329 | 5249 |  |  |  | 4927 |  |  | 35 | 27 |  |  |  |  |  |  |  |  | 694 | 45 |
| 46 | 3307 | 3225 | 3143 | 3061 | 2979 |  | 2814 |  |  | $36 \cdot 2567$ | 28.2149 |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 12 |  |  |  |  |  |  |  | 0533 |  | 28.8282 |  |  |  |  | 8822 |  |  |  |  | 47 |
| 48 | 910 | 90 | 8932 |  | 87 |  |  |  | 84： |  | 29.4416 |  |  | 474 |  |  |  |  |  |  | 48 |
| 49 |  |  |  |  |  | 6564 |  |  | 30 | 38.62 |  |  |  | 08 | 1000 | 11 | 1225 | 1337 | 1449 |  | 49 |
| 50 | 4899 | 4810 | 4721 | 4631 | 4542 | 4453 | 4363 | 4274 | 4184 | 39．4095 | $30^{\circ} 6683$ | 67 | 6913 | 702 | 714 | 2s | 7372 | 7487 | 7601 | 771 | 50 |
| 51 | 279 |  |  | 252 | 243 |  |  |  |  |  | 31.28 | 2934 |  |  |  |  |  |  |  |  |  |
| 52 | 06 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 52 |
| 53 | 859 |  |  |  |  |  |  |  | 7835 | 4177 | 32 |  |  |  |  |  |  |  |  | 617 | 53 |
| 54 | 649 | 639 |  | 6202 | 6105 |  |  | 5816 | 57 | 42.56 |  |  |  | 15 |  |  |  |  |  |  |  |
| 55 | 4389 | 429 |  |  |  |  |  |  | 3603 | $43 \cdot 35$ | 33 | 74 | 76 |  | 78 | 7983 | 8109 | 8235 | 238 | 848 | 55 |
| 56 | 2287 | 2187 |  |  |  |  |  |  |  | 44.13 |  |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 01 | －083 |  |  |  |  |  |  |  | $44^{9} 92$ | 34．9619 | 97 |  |  |  |  |  |  | 0666 |  | 57 |
| 58 | 8083 |  |  |  |  |  |  |  | 7254 | 45.7 | $35 \cdot 5$ |  |  |  |  |  |  |  |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  | ． 50 |  |  |  |  |  |  |  |  | 2970 |  |  |
| 60 | 387 | 3772 | 3665 | 3558 | 3450 | 334 | 3236 | 3129 | 3021 | 47.29 | $36 \cdot 8$ | 158 | 29 | 843 | 85 | 87 | 884 | 8984 | 9122 | 225 | 60 |
| 61 | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5274 |  |  |
| 62 | 96 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 62 |
| 63 | 75 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7289 |  |  |  | 63 |
| 64 | 547 | 535 | 5242 |  |  |  |  | 4671 | 4556 | 50．44 | 39 | 27 |  |  |  |  |  |  |  |  | 64 |
| 65 | 33 |  |  |  |  |  |  |  |  | ． 232 | 39.868 | 883 |  |  |  |  |  |  |  |  | 5 |
| 66 | 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 91 |  |  |  | 868 | 85 | 84 | 8327 | 820 |  | 41. |  | 12 | 14 |  | 1725 |  |  |  | 23 | 67 |
| 68 |  |  |  |  |  |  |  | 6212 | 69 | 53 |  |  |  |  |  |  |  |  |  |  | 68 |
| 7 | 496 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | d | 硡 | 433 | 4490 |  | 69 |
| 70 | 285 | 273 | 2609 | 2484 | 2359 | 2234 | 2109 | 83 | 1858 | 55.173 | $42^{\prime} 93$ | 9517 | 967 | 983 | 1000 | 0160 | 032 | 048 | 0642 | 080 | 70 |
| 71 | 07 | 0630 |  | 0377 | 0250 | 12 | 9996 | 9869 | 9742 | 55.96 | 43.54 | 56 | d |  | 2 | 6305 | 析 | 2701 |  |  | 71 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 212 |  |  |  |  |  |  | 72 |
| 73 | 655 | 22 | 6292 | 6162 | 6031 | 590 | 577 | 5 | 550 | 57.537 | 44.77 | 792 | 8093 | 826 | 84 | 85 | 8763 | 893 | 909 | 92 | 73 |
| 74 | 44 |  | 4187 | 4054 | 202 |  |  | 3525 | 3393 | 58.3260 |  | 4061 | 4231 | 440 | 4571 | 47 | 491 | 508 | 25 |  | 74 |
| 75 |  |  |  | 1947 | 1813 | 1679 |  |  | 1277 | 59．1142 |  |  |  |  | 07 | 088 |  | 123 | 140 |  | 75 |
| 76 | 0247 |  |  | 9840 | 970 |  |  |  |  |  |  |  |  | 668 |  | 7031 | 7206 |  |  |  | 76 |
| 77 | 814 | 8007 | 78 | 7732 | 7595 | 74 | 73 | 82 | 7044 | $60 \cdot 690$ | 47.229 | 246 | 26 | 2823 | 30 | 3176 | 33 | 353 | 370 | 303 | 77 |
| 78 |  |  |  |  |  |  |  |  | 2 | ， 47 |  | 8605 |  | 8963 |  | 析 |  | 9670 | 9858 |  | 78 |
| 79 | 3941 | 3800 | 59 | 3518 | 3376 | 3235 | 944 | 2953 | 2811 | 62．2670 | $48^{\circ} 45$ | 4741 | 492 | 510 | 5285 | 5467 | 5648 | 5829 | 6010 | 619 | 79 |
| 80 | 1839 |  | 1553 | 1410 | 126 | 1124 | 1 | 838 | 0695 | 63.0552 | 49.069 | 087 | 106 | 124 | 42 | 1612 | 179 | 197 | 216 | 23 | 80 |
| 81 | 9737 |  | 9447 |  |  |  |  |  | 8579 | 63.843 | $49 \cdot 68$ | \％ |  | 7385 |  |  |  | 812 | 8314 |  |  |
| 83 | 533 |  |  | 519 |  | （791 | 6756 |  |  |  | 50 | 12813 |  | 526 |  | 392 | －2 | 2 | 4618 |  |  |
| 83 | 5533 | 5384 | 52 | 508 | 4940 | 479 | 643 | 449 | 4346 | 65．419 | 50．909 | 928 | 9476 | 966 | 98 | ＋047 | 0238 | 042 | 061 | 08 | 83 |
| 84 | 13 |  |  | 析 | 2831 | 析 |  |  |  |  | 51.5228 | 5421 | 561 | 5807 | 600 | 619 | 538 | 527 | 518 |  | 84 |
| 85 | 1329 | 1177 | 25 | 0873 | 072 | 057 | 18 | 026 |  |  | $52 \cdot 13$ | 155 | 175 | 194 | 21 | 233 | 253 | 272 | 292 | 31 | 85 |
| 86 | 9227 | 73 | 8920 | 876 | 861 | 8459 | 8305 | 151 | 588 |  | 52.7 | 769 | 7890 | 80 | 82 | 84 | 8680 | 8877 | 907 | 927 | 86 |
| 87 | 71 | 6969 | 14 | 6659 | 6503 | 6348 | 6192 | 6036 | 588 | 68.57 | 53.362 | 3829 | 40 | 42 | 44 | 46 | 48 | 5027 | 522 | 54 | 87 |
| 88 | 20 | 4865 | 4708 | 455 | 4394 | 212 | 979 | 80 | 164 | 70.14 | 5， 5 | （101 | 6305 |  | 67 | O918 | 9 | 172 | 753 | 773 | 88 |
| 89 | 29 | 2762 | 2603 | 2444 | 2285 | 212 | 1967 | 1807 | 1648 | 70．1489 | 54．5896 | 6101 | 630 | 650 | 671 | 6918 | 7122 | 7327 | 753 | 773 | 89 |
| 90 | 0818 | 0658 |  |  | 0176 | P015 | 9854 | 9693 | 9532 | $70 \cdot 937$ | 55．2030 | 2237 | 2443 | 265 | 285 | 3063 | 3270 | 3476 | 3683 | 38 | 90 |
| ， | 876 |  |  | 8229 |  |  |  |  |  |  |  |  |  | ， |  | 9208 |  | 仿 |  |  |  |
| 92 | 661 | 6450 | 6286 | 6122 | 5957 | 579 | 628 | 5464 | 5299 | 72.513 | 56.429 | 4509 | 4720 | 493 | S | 53 | 5565 | 5776 | 5987 | 6 | 92 |
| 93 | 4512 | 4346 | 4180 | 14 | 884 | 3682 | 3516 | 3349 | 3183 | 73.3017 | 57．043 | 0645 | 0858 | 1072 | 1285 | 149 | 1712 | 1925 | 213 | 250 |  |
| 94 | 241 | 2243 | 2075 | 1907 |  | 5460 |  | 1235 | 1067 | 74．0898 | 57.636 | 6781 | 699 | 7212 | 1285 | 7898 | 7860 | 8075 | 2 | 850 | 94 |
| 95 | 030 | ＋139 | 9969 | 9800 | 仡 | 9460 | 90 | 9120 | 250 | 74：8780 | 58.269 | 291 | 313 | 335 | 357 | 378 | 400 | 422 | 444 | 466 |  |
|  | 820 | 803 | 7864 |  |  | 7349 | 78 | 006 | 8834 | 75.666 | $58^{\prime 8} 83$ | 9053 | 9273 | 949 | 咗 | 9934 | －154 | 0375 | 059 | 081 | 96 |
|  |  | 5931 | 5758 | 5 | 5412 | 5238 | 暏 | 4891 | 4718 | 76.454 | 59．496 | 5189 | 5411 | 563 | 5857 | 6079 | 矿 | 6524 | 674 |  |  |
|  | 400 | 382 | 3652 | 347 | 3302 | 3127 | 2952 | 2777 | 2601 | 77－2426 | 60．1099 | 1324 | 1549 | 177 | 1999 | 2224 | 24 | 2674 | 280 | 31 | 98 |
|  | 析 | 1724 | 1547 | 1370 | 193 | 1016 | 839 | 0662 | 0485 | 78.030 | $60 \cdot 7233$ | 7460 | 7688 | 7915 | 8142 | 8370 | 8597 | 8824 | 9051 | 27 | 99 |
| 100 | 9798 | ＇ | 441 | 9263 | 9084 | 8905 | 27 | 548 | 369 | 78．81 | 61.3367 | 596 | 826 | 4056 | 42 | 4515 | 4744 | 4974 | 5203 | 32 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | ${ }^{1} 8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | ＇ |  |  | $9^{\prime}$ |  |  | $6^{\prime}$ | $5^{\prime}$ |  |  |  | $1^{1}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | SINE． |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES．

| $38^{\circ}$ Cosine． |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 7841 | 7839 | 7837 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3 |  | ${ }_{352}^{568}$ | ${ }_{35}^{5677}$ | ${ }_{\text {3514 }}^{5674}$ | ${ }_{305}^{567}$ |  |  |  | ${ }_{\substack{1.56564}}^{1.5}$ | ${ }_{1}^{1.8609}$ |  |  | ${ }_{8228}^{248}$ | ${ }_{8634}^{2243}$ | ${ }^{22884}$ | ${ }_{8668}^{2232}$ | 237 | ${ }_{8662}^{2841}$ |  |  |
|  | 4 419 |  |  | ${ }_{9194}^{135}$ |  |  |  |  |  |  |  |  |  | ${ }_{1046}^{4837}$ | 4 | ${ }_{1859}^{1859}$ |  | 4873 | 4888 103 |  |  |
|  |  |  |  |  |  |  |  |  |  |  | ${ }^{3} 7214$ | $722$ |  |  |  |  |  |  | 3 |  |  |
|  |  |  |  | 487 | 485 |  |  |  |  |  |  |  |  |  | 3488 | 3496 | 3512 |  | 3544 |  |  |
|  |  | ${ }_{\text {O581 }}^{2739}$ | ${ }_{0565}^{2724}$ |  | ${ }_{053}^{2095}$ |  |  | ${ }_{0484}^{2625}$ | 2638 |  | 5．582 |  |  |  | 5903 | 5924 | 5944 |  |  |  |  |
| 1 | 108442 | ${ }_{8424} 8$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{6266}$ | ${ }^{624} 8$ | ${ }_{\text {l }}^{626}$ | ${ }_{4}^{62064}{ }^{606}$ | ${ }^{618}$ | ${ }_{4000}^{6167}$ | ${ }_{\substack{1977 \\ 3978}}^{63}$ | ${ }^{6127}{ }^{696}$ |  | \％ $6 \cdot 8228$ |  | ${ }_{4833}^{8276}{ }_{4}^{88}$ |  | ${ }^{83326}$ | $\begin{aligned} & 8351 \\ & 4565 \end{aligned}$ | ${ }_{2}$ | ${ }_{4620}^{840}$ |  |  |  |
|  |  | ${ }_{4}^{4198} 1$ | ${ }_{192}^{408}$ | ${ }_{1904}^{4065}$ | 4043 | 188 | ${ }_{183}^{4000}$ | 1810 | ${ }_{1786}^{3756}$ | ${ }_{10} 0.1763$ | ${ }_{8} .06381$ |  | ${ }_{0689}^{4683}$ |  |  |  |  |  |  |  |  |
|  | $4{ }^{4} 9818$ | 9793 | 9768 | 9742 | 9717 | 9692 | 9666 | 964 | 9616 |  | $8 \cdot 6$ | 6865 | 6897 | 6929 |  | 6993 | 7025 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{5259} 5$ |  |  |
|  | 181195 | 16 | 113 | ${ }_{1}^{2397}$ | 1065 | ${ }^{1032}$ | 1000 |  | 0935 |  | 11. | 1683 | 1725 | 1766 | 1807 | ${ }_{1848} 56$ | 1889 | 1930 | 1971 |  |  |
|  |  |  |  |  | 8902 | 8867 | 8833 | 3799 | 8764 |  |  |  |  |  |  |  | 3105 | 8148 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 4689 | 4651 |  |  |  |  | 462 | 4224 | 17.52 | S025 |  |  |  |  |  |  |  |  |  |  |
|  | 22771 | 233 | 24922 | ${ }_{0291}^{2452}$ | 245 | ${ }^{2373}$ |  | ${ }_{0}^{2293}$ | ${ }^{2083}$ |  |  | 207 | 12559 | ${ }_{2812}^{602}$ |  |  | ${ }_{2969}^{6753}$ |  | 3074 |  |  |
| $\begin{aligned} & 23 \\ & 24 \end{aligned}$ | 248260 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | 3448 | 3901 | 3854 |  | 37 |  |  |  |  | 20.3525 |  |  | ${ }^{1380}$ |  | 1498 | $1558$ | $\begin{gathered} 1617 \\ 7833 \\ \hline \end{gathered}$ | 100 | 1735 |  | ${ }^{6}$ |
|  | 7 1792 | 1774 |  |  | 15937 |  |  | ${ }_{2251}^{1451}$ | ${ }^{14232}$ |  |  | 7525 | 7357 73 | ${ }^{7648}$ | 7710 | 7771 | ${ }^{7833}$ | 17894 | 7917 |  |  |
|  |  |  |  | 7323 | 7271 |  |  |  |  |  |  |  |  | 358 | 㝃 |  | 教 |  | 937 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1369 | 31 | 5057 | 3001 | 2945 |  |  | 27772 |  |  |  | 2344 | ${ }^{2414} 4$ | 85 | ${ }^{2556}$ |  | ${ }^{2697}$ | ${ }^{688}$ | 238 |  |  |
|  | 8857 | ${ }^{\text {8797 }}$ | 0878 <br> 8738 <br> 08 | 0840 8678 | （0882 | （i859 | ${ }_{850}^{068}$ | ${ }^{0} 8408$ | 8380 | ${ }_{25}^{25}$ | 20．43 | ${ }^{88753}$ | ${ }_{4828} 86$ | ${ }^{8094} 4$ | 479 | ${ }^{8854}$ | 8129 | 5204 | 52 |  |  |
|  | 54.6701 |  | 6579 | 6517 | ${ }_{4}^{6456}$ |  |  |  |  | ${ }^{22 \cdot 6748}$ | 1.0880 |  |  | ${ }_{732}^{113}$ | 1190 | ${ }_{7481}^{1268}$ | ${ }^{13545}$ |  | ${ }_{721}^{1500}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{3367}$ |  |  |  |  |  |  |  |  |  |
|  | 2336 | 236 | 100 | ${ }_{0}^{2933}$ | 9967 | 9900 | 983 | 9766 |  |  |  |  |  |  |  | 9909 | 9993 | 178 | 162 |  |  |
|  |  |  | 794 |  | 7804 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 362 | 3550 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 11610 | ${ }^{1336}$ | 930 | ${ }^{1388} 1$ | ${ }^{1314} 1$ | ${ }^{1240} 5$ | ${ }^{116999}$ | ${ }_{8}^{10923}$ | ${ }_{8847}^{1018}$ |  |  | ${ }^{4339}{ }^{459}$ | 1484 |  | ${ }_{688}^{6671}$ |  | ${ }_{\text {c }}^{4857} 1$ |  |  |  |  |
|  | 729 | 722 | 7164 | 722 | 698 | 6971 | 6833 | ${ }_{675} 6$ | ${ }^{8847}$ | 33.659 |  | 6799 | 6897 | 6996 |  | 7192 |  | 738 | 7485 |  |  |
|  | 514 |  | 4988 | 4805 | 4825 | 474 |  | 458 | 450 |  |  | 3004 |  |  | 51 | 3405 |  |  |  |  |  |
|  | 083 | 0748 | 06 | 058 | 0499 | 0416 | 1333 | 0250 | 0166 | 36．0083 | 28.5308 | 15413 | 18 | 5623 | 5728 | 5833 | 38 | 6042 | 6147 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4364 | ${ }_{4}$ | 418 | 403 | ${ }_{4010}^{617}$ | ${ }^{6082}$ | 383 | 37 | ${ }^{585}$ | 38. |  | ${ }_{4027}^{7823}$ | ${ }_{4} 1338$ | ${ }_{4251}^{8042}$ |  |  |  |  |  |  |  |
|  | 4364 |  |  | 19 | 1887 | 172 |  | 157 | 148 | 3911395 | 31. | 232 |  |  | 0574 |  |  | 16 | 30 |  |  |
|  | 0.052 | 9960 | ${ }^{9878}$ | 1976 | ${ }^{9684}$ | 959 |  | 9407 |  |  |  | ${ }^{6}$ | 6553 | 6669 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 358 | ${ }_{3}^{348}$ | ${ }^{3330} 12$ | 13 | 31 | ${ }^{3097}$ | 2999 | 2922 | ${ }_{063}^{284}$ |  |  | 5050 | 5774 | 5297 | 5420 | ${ }^{5543} 17$ | ${ }^{5666}$ | ${ }^{5789}$ | 5912 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 711 | 701 | 69 | ${ }_{68} 8$ | 888 | ${ }_{66} 8$ | ${ }^{64969}$ | 6396 | ${ }_{6293}$ | ${ }_{44 \cdot 6190}^{40}$ | ${ }^{35 \cdot 3534}$ | 3664 |  |  |  |  |  |  |  |  |  |
|  | 489 | 485 | ${ }_{2592}^{4752}$ | ${ }^{4667}$ | ${ }^{4542}$ | ${ }^{4} 433$ | ${ }^{4333}$ | ${ }^{2228}$ | ${ }^{4123}$ | 45 |  | ${ }^{986}$ | 1 | ${ }^{0133}$ | ${ }^{20266}$ |  | ｜os30 |  |  |  |  |
|  | 60 0649 | O541 | 0433 |  | 0216 | 108 |  | 988 | 9782 |  | 37.214 |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{8383}$ | ${ }_{\substack{8273 \\ 6114}}$ | ${ }^{816}$ | ${ }^{8883}$ | ［7943 | 7 | ${ }_{5}$ | ${ }_{5442}^{7612}$ | ${ }_{88}^{4775501}$ |  | ${ }^{88883}$ | 4829 | 边 8961 |  |  |  |  |  |  |  |
|  | ${ }_{4}^{4} 838$ | 408 | 3939 | 38 | 3727 | 36 | 3499 | 3385 | 3271 | ${ }^{45} 3.3575$ | 39．0748 | 08 | 36 | 1179 | 1323 | 1467 | ${ }^{1618}$ | ${ }^{1754}$ | 1897 |  | ${ }^{63}$ |
|  | ${ }^{2087}$ | 19753 | 9636 | ${ }_{9518}^{19}$ | 9404 | ${ }_{9283}^{148}$ | ${ }^{1} 966$ | 0048 | 8931 | 50\％ | $40 \cdot 3$ | 330 | 3450 |  |  |  |  | 419 |  |  |  |
|  |  |  | 74 |  |  |  |  | 6880 |  | 1.66 |  | 950 |  |  |  |  |  |  |  |  |  |
|  | 67 585 | ${ }^{543}$ | ${ }_{3157}^{5317}$ | 303 | 2912 | ${ }^{2789}$ | ${ }_{26}^{48}$ | ${ }_{2543}^{47}$ | ${ }_{2420}^{4580}$ | ${ }_{53}^{5232997}$ | ${ }_{42}^{42.17585}$ | 1915 | 2070 | ${ }_{2225}^{6016}$ | ${ }_{238} 1$ | ${ }_{2535}^{632}$ | ${ }_{2690}^{648}$ | ${ }_{2885}^{6027}$ |  |  | 68 |
|  |  | ${ }_{8965}^{1122}$ |  |  |  | 0624 |  | 0374 | 0249 |  | 42.7962 43465 4 | ${ }_{4325}^{8120}$ | 边 8278 | 843 |  |  | ${ }_{5123}^{8906}$ |  |  |  |  |
|  | 71935 | 1680 | 66 | 65 |  | 6294 | 6166 |  | 59 |  |  | 0529 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 4259 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 2432 | 23 | ${ }^{22}$ | 9933 | 9794 | 18666 | 953 | ${ }^{1598}$ |  | $45^{45}$ | ${ }^{2143}$ | ${ }^{331}$ | 9881 | ${ }^{3649}$ | ${ }^{33818}$ | 3987 | 155 | ${ }_{0324}^{403}$ |  |  |
|  | ${ }_{5} 58312$ | 8176 | 8041 |  |  | 7635 |  | 7363 |  |  |  | 15348 |  |  |  |  | 203 | 535 |  |  |  |
|  | 618 | 601 | ${ }^{58}$ | 5744 | 5607 | 5470 | 15332 | 5195 |  |  |  | 1552 | ${ }^{1726}$ | 1899 | 2072 | 1224 |  |  |  |  |  |
|  | ${ }_{78}{ }^{4} 18$ |  |  |  |  |  |  | ${ }^{3085}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 析 |  |  |  |  |  | 88 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 80 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 3073 | 29 |  |  | 24 | 2332 | 2184 |  |  |  |  |  | 9154 |  |  |  |  |  |  |  |
|  | 33 |  |  |  | 0466 | 0316 | 0166 |  | 788 |  | 5 | 498 |  |  |  |  |  | 612 |  |  |  |
|  | ${ }^{84} 858$ |  |  | ${ }^{6}$ | 6139 |  |  |  |  |  |  |  | ${ }_{7588}$ | 778 | 797 | 116 | ${ }_{836} 8$ |  |  |  |  |
|  | 864598 | 444 | ${ }^{4287}$ | ${ }^{4132}$ | ${ }^{3976}$ | ${ }^{3821}$ | ${ }^{3666}$ | 3510 | ${ }^{33}$ |  | ${ }_{5}^{53} 3.363$ | ${ }^{35}$ | ${ }^{3795}$ | 33991 | 4187 | ${ }^{4383}$ | 4579 |  |  |  |  |
|  | 888 |  |  |  | ${ }_{9650}$ | 9491 | 93 | 1943 | 9014 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 89 | 7969 |  |  | 7887 | 7326 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 905974 | 5812 | 564 | 548 |  | 516 |  |  |  |  | $55 \cdot 8212$ |  |  |  |  |  |  |  |  |  |  |
|  | 12318 | ${ }^{3654}$ | ${ }^{33490}$ |  | ${ }^{3161}$ | 2 | ${ }^{2832}$ | ${ }^{26}$ | ${ }^{2533}$ |  | 56.4414 | ${ }^{\text {a }}$ | ${ }_{103}^{483}$ | ${ }_{1246}^{\substack{\text { ¢037 }}}$ | 6 | ${ }_{1}^{5656}$ | 759 |  |  |  |  |
|  |  |  |  |  |  | 8667 | 8499 | 8331 | 8162 |  | 57.6819 | 7031 |  |  |  |  |  |  |  |  |  |
|  | ${ }^{94} 735$ | 7181 | 711 | 6882 | 6672 | 6502 | 46 | ${ }^{6162}$ | 5992 | ${ }_{7}^{73}$ | ${ }_{58}^{58,302}$ |  | 3455 | ${ }^{3665}$ | 387 |  | 4357 |  |  |  |  |
|  | 95 | 286 |  |  |  |  |  | 1825 |  |  |  |  | 15864 | 16083 | 6302 | 6521 | ${ }^{6739}$ |  |  |  |  |
|  | 97083 | 0708 | 053 |  |  |  | 983 | 9657 | 948 |  |  | 1850 |  | 2292 |  |  |  |  |  |  |  |
|  |  | 855 | 8374 | 8197 | 8020 | ${ }^{7} 842$ | 7665 | 7488 | 7311 | 76 | 60.783 | ${ }_{8}^{8054}$ | ${ }_{82788}^{8278}$ |  |  |  |  |  |  |  |  |
|  | 100 | 1235 | 405 | ${ }^{6735}$ | 3594 | ${ }_{313}$ | 3332 | 15 | 290 | ${ }_{8} 82789$ |  |  |  |  | 114 |  |  |  |  |  |  |
|  |  |  |  |  | $3^{6}$ | ${ }^{35^{\prime}}$ |  |  |  |  |  |  |  |  |  | 135 | ${ }^{34}$ | 33 |  | $31^{+}$ |  |
|  | $51^{\circ}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |

TRAVERSE TABLES．

|  |  |  |  | Cosint |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3378 38 | 3873 | 3 |  |  |  |  |  |  |  |  | （8989 |  |  |  |  |  |  |  |
|  | 5 513909 | ${ }^{29279912}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5 ${ }^{6958585}$ | ${ }^{27770} 50$ | ${ }^{27535}$ |  | ${ }^{87719} 80806$ |  |  |  |  | 3932 | ${ }_{\text {cose }}^{3388}$ |  | ${ }^{3322}$ |  |  |  |  |  |  |
|  |  | cose | cose |  |  | 2321 |  |  |  | （8， 8 | （038） | ${ }^{\text {and }}$ | ${ }^{3868} 8$ |  |  |  |  |  |  |
|  | 6687 66 | ${ }^{6067} 66027$ | ${ }^{6027} 160$ |  |  |  |  |  |  | 2020 |  | ${ }^{527} 8$ |  | 882 | 2 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5s， | ） 954 | （2314 |  | ， 2854 | $\xrightarrow[\substack{3888 \\ 780}]{\substack{20}}$ | ${ }^{3982}$ |  |  |  |  | 226 | 20682020 |  |  |  |  |  |  |
|  |  | 5188 S 5159 | 515 |  |  |  |  |  |  |  |  | $6{ }^{658}$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5020 | ${ }^{8} 8$ |  | cose | cese | d |  |  |  | 退 832 | 28856 | ${ }^{36648280}$ |  |  |  |  |  |  |  |
|  | ${ }^{3} 8384$ | 43814 | 427 |  | 41575 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 218 | ${ }^{21348} 2004$ |  |  | 1974 10.35 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7 |  |  |  | ${ }^{70} 5$ |  |  |  |  |  | ${ }^{58} 9513$ |  |  |  |  |  | 567 93804 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{972} 22^{2031}$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 退 | 5909 685 | ${ }^{6851}$ | ${ }^{51765} 5$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{23}$ | ${ }_{\text {a }}^{23575}$ | ${ }^{2436}$ |  | ${ }^{232888} 2287$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2351030 | 退 32370 | ${ }^{0319} 002011$ |  | 79 |  |  |  |  | ${ }_{\text {cose }}^{2288}$ |  | ${ }^{\text {a }}$ |  |  | Sos |  |  |  |  |
|  | 087 |  |  |  | ${ }_{\substack{5779}}^{538}$ | ${ }^{36559}$ |  |  |  |  | 250 81839 | （1） | ${ }_{\substack{187 \\ 819}}$ |  |  |  | ${ }^{3} 9723$ |  |  |
|  | ${ }^{73595}$ |  |  |  |  | ＇ |  | 28．83 |  | ${ }^{181875}$ | 4020 |  |  |  | 5il｜ 40837 |  | lition |  |  |
|  | 7 | ${ }^{3322} 512$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{0}^{2173}$ | ${ }_{20}^{5147} 5$ | ${ }_{2078}^{5078}$ |  | 288120 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{\text {a }}$ |  |  |  |  |  |  |  | ${ }_{\text {cise }}^{532}$ | $\pm$ |  | ${ }^{1743}$ |  |  |  |  |  |  |
|  | 552264 | 64446368 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 8464 |  |  |
|  |  | ${ }^{42888}$ |  |  | ${ }^{3,7666^{38889}}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | ${ }^{81865}$ |  |  |  | 35926 | 20：338 | ${ }^{6665}$ | ${ }^{515} 5$ | 5866 | ${ }^{63}$ | 13 | 50． |  | 3 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{\text {a }}$ | ｜lal |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{1939} 9$ | ${ }^{20388} 888$ | ${ }^{804558} 8$ |  |  | ${ }^{86838}$ | \％ |  |  | ${ }^{73896}$ | ${ }^{715}$ | 715 | ${ }^{1835}$ |  | 9 |  |  |  |  |
|  | ${ }^{47828}$ | ${ }^{66858} 4258$ | 45 | ${ }^{23989}$ | 2302 |  |  |  |  | 0， 23 |  |  |  |  |  |  |  |  |  |
|  | ${ }^{5}$ | ${ }^{233}$ | ${ }^{20335}$ |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }_{3364}$ |  |  |
|  |  | $51598$ |  |  |  |  |  |  |  |  |  | 退 8838 | 2923］ |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 12 | ${ }_{9}^{1 / 555}$ | 15 | ${ }^{13131}$ | \％ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{3,17} 717$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 29 | ${ }_{2293}^{220315}$ | ${ }^{2915} 42015$ |  | ${ }^{8}$ |  |  |  | 921 |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{0} 8$ | ${ }^{\text {a }}$ | ${ }^{0} 883780$ |  | （02089 |  |  | 80， |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 650262 | 62 | ${ }^{\text {0043 }}$ |  |  |  |  |  | 1010 | $1{ }^{1160}$ | 11601313 | \％ | 1610 | ${ }^{10} 1736$ |  |  |  |  |
|  |  | ${ }^{425}$ | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7 |  | ？ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5 |  |  | ${ }^{51356}$ |  |  |  |  |  |  |  |  |  |  |  |  | ${ }_{4}^{3277}$ |  |  |
|  | ， |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | \％ 688 |  |  |  |  |  |  |  | 18.06 |  | 20097028 |  |  |  |  |  |  |  |  |
|  | ${ }^{2} 8$ | ${ }^{\text {a }}$ | $4{ }^{450}$ | ${ }_{2}^{4231}$ |  | ${ }^{6}$ | 8 | ${ }_{60}^{50,35}$ |  | ${ }^{382}$ | 56， 3637 | ${ }^{4575}$ | ${ }^{383}$ | 337 3878 | ${ }^{76}{ }^{4} 448$ | ${ }^{488}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{8117} 7$ | ${ }^{831}$ | ${ }_{\text {l }}^{\text {ciser }}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{3,5}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5 | ${ }^{24346} 92284$ |  |  | 888138068 |  |  |  |  |  |  | jos5 | ${ }^{25364} 7404$ | 763 | ${ }^{31} 17820$ |  |  |  |  |
|  |  | 98909 | ${ }^{7808}$ |  | ${ }^{6} 63979$ | ${ }^{258}$ | 3384 |  |  | ${ }^{30} 931$ | ${ }_{\substack{395 \\ 9524}}$ |  | $9786$ |  |  |  |  |  |  |
|  |  | ${ }^{27}$ | 27 |  |  |  |  |  |  |  |  |  | 980 61 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{4}^{68}$ | ${ }^{631}$ |  |  |  |  |  |  |  |  |  | ${ }_{63}^{443} 8$ |  |  |  |  |  |  |  |
|  |  | ${ }_{\text {a }}^{20093}$ |  |  |  |  |  |  |  |  |  |  |  | ${ }^{7} 1717378$ |  |  |  |  |  |
|  | d | ${ }_{7}^{27535} 770689$ |  | ${ }^{315154} 5683$ | 6883 6814 | ${ }_{6}^{8835}$ | \％ |  |  |  | 9362 | 362 3 3574 | 5744 3785 | 9997 |  |  |  |  |  |
|  |  | ${ }_{6}^{1} 15313$ | ［1311 |  |  | ${ }^{4259}$ |  |  | $58: 5166$ |  |  |  |  | 2230 | ${ }^{66}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{1885}$ |  |  |  | ${ }^{2068} 5385$ | ${ }^{3521}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 18831702 | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| 38 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | $51^{\prime}$ | 52 | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | $56^{\prime}$ | $57^{\prime}$ | $58^{\prime}$ | 59 | $50^{\prime}$ | 1 | $52^{\prime}$ | 53 | $54^{\prime}$ | 55 | 56 | $57^{\prime}$ | $58^{\prime}$ | 59 |  |
|  | 779 | 7788 | 77 | 7784 | 7782 | 778 | 77 | 7777 | 777 | 777 | 271 | 27 | 6275 | 627 | 6280 | 6282 | 6284 | 6286 | 6289 | 6291 |  |
| 2 | 55 | 55 | 5572 | 5569 | 5565 | 5561 | 5558 | 5554 | 5550 | $\cdot 55$ | 2 | 2546 | 25 | 25 | 25 | 256 | 2568 | 25 | 25 | 2582 |  |
|  | 336 | 3364 | 3358 | 矿 | 3347 | 3342 | 3336 | 3331 | 3325 | 2．332 | 18812 | 88 | 8825 | 8832 | 8839 | 8846 | 8852 | 88 |  | 8873 |  |
| 4 | 1159 | 1152 | 1144 | 1137 | 1130 | 1122 | 1115 | 1108 | 1100 | 3．1093 | $2 \cdot 508$ | 508 | 510 | 5109 | 5119 | 512 | 5137 | 51 | 51 | 5164 |  |
| 5 | 894 | 8940 |  | 8921 | 8912 | 8903 | 8894 | 8885 | 8876 | 3.8866 | ．1353 | 1364 | 137 | 1387 | 1398 | 1409 | 1421 | 1432 | 1443 | 1455 | 5 |
| 6 | 6738 | 672 | 17 | 67 | 669 | 66 | 6673 | 662 | 6651 | 4.6640 | $3 \cdot 7623$ | 7637 | 7651 | 7664 | 7678 | 7691 | 7705 | 7719 | 7732 | 7746 |  |
| 7 | 45 |  |  |  |  |  |  |  | 4426 |  |  | 3910 | 2 | 3942 | 3957 | 73 | 3989 | 05 | 4021 | 4037 |  |
| 8 | 2318 | 23 | 2289 | 2274 | 2259 | 2245 | 2230 | 2 | 2201 | 21 |  | 01 | 02 | 02 | 0237 | 0255 | 0273 | 0291 | 0309 |  |  |
|  | －18 |  |  |  |  |  |  |  | 981 |  |  | 645 | 647 | 6496 | 6517 | 6537 | 6557 | 6578 | 6598 | 661 |  |
| 10 | 789 | 7879 | 7861 | 7843 | 7824 | 7806 | 7788 | 7769 | 51 | 7.7733 |  | 2728 | 2751 | 774 | 79 | 2819 | 2842 | 2864 | 2887 | 2909 | 10 |
| 11 | 56 | 5667 | 5647 | 5627 | 5607 | 558 | 5567 | 5546 | 5526 | 8.5506 | 6.8976 | 00 | 9026 | 9051 | 9076 | 9101 | 9126 | 9151 | 9176 | 9200 |  |
| 12 | 3477 | 3455 | 3633 | 341 | 317 |  |  |  |  |  |  | 527 |  | 53 | 53 |  |  | 54 | 5464 |  | 2 |
| 13 |  |  |  |  |  |  | 11 | 1100 | 107 | $10 \cdot 10$ | 51 | 1547 | 15 | 16 | S36 | 1665 | 1694 | 173 | 1753 | 1782 | 13 |
| 14 | 9056 | 903 | 9005 | 89 | 8954 | 8928 | 89 | 8877 | 8852 | 10.88 | 877 | 782 | 78 | 78 | 7915 | 794 | 797 | 80 | 3042 | 073 | 14 |
| 15 | 684 |  |  |  |  |  |  |  |  | 11.659 | ． 405 | 409 | 412 | 4160 | 4194 | 4228 | 426 | 4296 | 4330 | 436 | 15 |
| 16 | 46 |  |  |  |  |  |  |  |  | 12 | 10.032 |  | 0402 |  | 0474 |  | 0547 |  |  |  | 16 |
| 17 | 24 | 2394 |  | 2332 |  |  |  | 2208 | 217 | 13 |  |  |  |  |  | 6792 | 6831 |  |  |  | 7 |
| 18 | 02 | 0182 | 0150 | 0117 |  |  | ＋018 | 9985 | 972 | 13.9 | 11 | 2911 | 29 | 29 | 3033 | 3074 | 311 | 3156 | 3196 |  | 8 |
| 19 |  |  |  |  |  |  |  |  | 772 | 14. |  | 918 |  | 92 | 9313 | 9356 | 939 | 9442 | 9485 |  | 19 |
| 20 | 5795 | 5758 | 5722 | 5685 | 5649 | 5612 | 76 | 5539 | 02 | 15.5 | 12 | 5457 | 5502 | 5547 | 5593 | 563 | 5683 | 72 | 577 | 5819 | 20 |
| 21 | 358 | 3546 | 3508 | 3469 | 3431 | 3393 | 3354 | 3316 | 3278 | 16.3239 | 13 | 1730 | 1777 | 1825 | 1872 | 1920 | 196 | 2015 | 2062 | 2110 | 2 |
| 22 | 137 | 1334 |  |  |  |  |  |  |  | $17 \cdot 10$ | 13.79 |  |  |  | 8152 | 8202 |  |  |  |  | 22 |
| 23 | 9164 | 912 | 9080 | 9038 | 89 | 8954 | 8912 |  | 8828 | $17 \cdot 8$ | 14.42 | 4275 |  | 43 | 4432 | 4484 | 4536 | 4588 |  |  | 23 |
| 24 | 695 | 691 |  | 682 | 677 | 6734 | 6691 | 6647 | 660 | 18.65 | 15 | 0548 |  | 0657 | 0711 | 0765 | 0820 | 0874 |  | 983 | 24 |
| 25 | 4743 |  |  |  |  |  |  |  |  | 19.4332 | 15 |  | 6878 | 6934 | 6991 | 7047 | 7104 | 7161 |  |  | 25 |
| 26 | 253 |  |  |  |  |  |  |  |  | 20.210 |  |  |  |  | 270 |  |  |  |  |  | 26 |
| 27 | 032 | 027 | 0224 | 01 | 012 | 0076 | ＋027 | 997 | 992 | 20.9879 |  |  |  |  | 9550 | 9611 | 9672 | 9733 |  |  |  |
| 28 | 81 |  |  |  |  |  |  |  |  | 21.76 | $17 \cdot 5$ |  |  | 57 | 583 | 5893 |  |  |  |  | 28 |
| 29 | 590 |  |  |  |  |  |  | 5532 | 5478 |  | 181 | 19 |  | 2046 | 2109 | 2175 | 2241 | 230 |  |  | 29 |
| 30 | 369 | 363 | 3583 | 3528 | 3473 | 3418 | 3363 | 3308 | 32 | 23 | 18.81 | 8185 | 825 | 8321 | 838 | 8457 | 852 | 85 | 66 | 872 | 30 |
| 31 | 14 | 1425 | 1369 | 1312 | 1255 | 1199 | 1142 | 1085 | 1029 | $24^{\circ} 0972$ | 19. | 4458 | 4528 | 4598 | 466 | 473 | 4809 | 4879 | 4949 | 5019 |  |
| 32 | 927 |  |  |  | 9038 |  |  | 8862 | 8804 | $24 \cdot 874$ |  |  |  |  |  | 102 |  |  | 238 | 31 | 32 |
| 33 | 7061 | 700 | 6941 | 688 | 6820 |  | 6700 | 6639 | 657 | $25 \cdot 65$ | $20 \cdot 692$ |  | 707 | 715 | 722 | 7303 | 73 | 7452 | 52 | 760 | 33 |
| 34 | 48 | 478 | 47 |  |  |  |  | 4416 | 435 | $26 \cdot 42$ | $21 \cdot 31$ |  | 3353 | 3430 |  |  | 36 | 37 | 3815 |  | 34 |
| 35 | 2641 | 2572 |  |  |  |  | 2257 |  |  | $27 \cdot 2065$ | 219470 |  |  |  | 9787 |  |  | 025 |  | 183 | 35 |
| 36 | 0430 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 36 |
| 37 | 8220 | 81 | 8085 | 8018 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 37 |
| 38 | 6010 |  |  |  |  |  |  | 552 |  | 29.53 | $23 \cdot 8$ |  | 84 |  | 86 | 87 |  |  |  |  | 38 |
| 38 | 3800 | 328 | 365 |  |  |  |  | 3301 | 3230 | 30．31 | $24 \cdot 45$ |  | 4729 | 481 | 4906 | 49 | 5082 | 517 | 525 |  | 39 |
| 40 | 1589 | 1516 | 1443 | 137 | 1297 | 122 | 51 | 1078 | 1005 | 31.0932 | 25. | 091 | 1004 | 109 | 118 | 127 |  | 145 | 154 | 163 | 40 |
| 41 | 93 | 9304 | 9229 | 9155 | 9080 | 9005 | 8930 | 885 | 8780 | 31 | $25 \cdot 7093$ | 7186 | 7279 | 7372 | 7465 | 7558 | 7650 | 7743 |  |  | 41 |
|  |  |  |  |  |  |  | 6709 | 6632 |  | 32．6478 |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 495 | 48 | 48 | 4723 | 4645 |  | 4487 | 4409 | 4330 | 33．4251 |  |  | 9829 | 992 | ＋22 | 01 | 0219 | 0316 | 04 |  |  |
| 44 | 27 | 266 | 258 |  |  |  |  |  |  | 34．202 |  |  | 6104 | 620 | 630 | 64 | 6503 | 660 | 670 | 6801 |  |
| 45 | 0538 | 045 |  |  |  | 0127 | 1045 |  |  | 34．9798 | 28 | 2278 | 2380 | 2481 | 2583 | 2685 | 2787 | 288 | 291 | 092 | 45 |
| 46 | 8328 |  |  |  |  |  |  |  |  |  | $28 \cdot 84$ |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 611 |  |  |  |  |  |  |  |  |  | 29 |  |  |  |  |  |  |  |  |  |  |
| 48 | 390 |  |  |  |  |  |  | 32 | 320 | 37 | $30^{\circ} 017$ |  |  | 1314 | 14 |  |  |  |  |  | 48 |
| 49 | 1697 | 16 | 151 | 1429 | 1339 | 250 |  | 107 | 098 | 38.089 | $30 \cdot 72$ | 76 | 7880 | 759 | 770 | 78 | 792 | 803 | 8145 | 825 | 4 |
| 50 | 9487 | 939 | 930 | 921 | 9122 | 9030 | 8939 | 884 | 8756 | 38.8665 | 31） | 矿 | 3755 | 源 | 398 | 409 | 420 | 432 | 443 | 256 |  |
| 51 | 72 | 7183 |  | 6997 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 50 |  |  |  |  |  |  |  | 4306 | 40．4211 | 32．6070 |  |  |  |  |  |  |  |  |  |  |
| 53 | 285 | 27 | 2662 |  | 24 | 23 | 2275 | 21 | 2081 | $41 \cdot 19$ | 33.23 |  |  | 27 | 28 | 29 | 30 | 3180 |  | 342 |  |
| 54 | 064 |  |  |  |  |  | －054 | 995 |  | 41.97 | $33 \cdot 8$ |  |  | 897 |  | 92 | 93 | 9467 |  |  |  |
| 55 | 84 | 8335 | 823 | 8134 | 8034 | 7933 | 7833 | 7732 |  | 42.7531 | 34．4881 |  |  | 5255 | 5380 | 5504 | 5629 | 5753 | 5878 | 600 | 55 |
| 56 | 6225 |  |  |  |  |  |  |  |  | 43.5304 | $35^{\circ} 1$ |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 40 |  |  |  |  |  |  |  |  | 44.30 | 35.7 |  |  |  |  |  |  |  |  |  |  |
|  | 180 |  |  |  |  |  |  |  |  | ．085 | 36．36 |  | 39 | 408 | 4219 | 435 |  | 612 | 475 |  | 58 |
| 59 | 9594 | 948 | 9379 | 927 |  |  | 8948 | 8840 | 87 | $45 \cdot 8624$ | 36.98 | －037 | 02 | 03 | 049 | 063 | 0765 | 0899 | 1032 | H65 |  |
| 60 | 7384 | 727 | 71 | 705 |  |  | 62 |  | 65 | 46.6397 | $37 \cdot 623$ | 637 | 631 |  | 678 | 691 |  | 18 | 32 | 745 |  |
| 61 | 517 | 5062 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 296 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 0753 | 06 | 05 |  | 0293 | 0178 | －0 | 99 | 983 | 48.97 | $39 \cdot 50$ | 51 | 53 | 547 | 56 |  |  |  | 618 | 63 |  |
| 64 | 85 |  |  |  |  |  |  |  |  |  | 40 | 14 | 160 | 175 | 1817 | 204 |  | 2331 |  |  |  |
| 65 | 633 | 621 | 609 | 5977 |  | 573 | 562 |  |  | 50.5264 | 40 |  |  |  | 817 |  |  |  |  |  | 65 |
| 66 | 412 |  |  |  |  |  | 339 |  |  |  | 41.38 |  |  |  |  |  |  |  |  |  |  |
| 67 | 19 |  | 16 |  |  | 1300 | 117 |  | 093 | 52.0810 | 42.01 |  |  |  |  |  |  |  | 1342 |  |  |
|  | 97 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 68 |
| 69 | 7492 | 736 | 724 |  |  | 6862 | 6736 |  | 648 | 53.635 | 43.26 | 28 | 29 | 313 | 32 | 34 | 36 | 376 | 391 | 1075 |  |
| 70 | 52 | 515 | 5026 | 488 | 4770 |  | 4514 |  | 4258 | 54.4130 | 43.89 | 90 | 9257 | 倍 | 957 | 973 | 987 | 163 | 0208 | 075 | 70 |
| 71 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 0861 | 07 | 05 | 0467 | 0335 | 0203 | －07 |  | 9809 | 55.96 | 45. |  |  |  | 仡 |  |  |  |  |  |  |
| 7 | 8651 | 85 | 83 | 8251 | 8117 | 7984 | 7851 | 77 | 7584 | 56745 | 45.775 | 79 | 8082 | 8248 | 84 | 85 | 87 |  | 90 | 92 |  |
|  | 6440 |  |  |  |  |  | 5629 | 517 | 5359 |  | （ | 4， | 435 | 452 | 469 | 48 | 5028 | 519 | 5362 |  |  |
| 75 | 4230 | 409 | 395 | 3819 | 3682 | 3545 | 408 | 3271 | 313 | 58.299 | $47 \cdot 029$ | 046 | 063 | 80 | 097 | 11 | 131 | 148 |  |  | 75 |
|  | 2020 | 1881 | 1742 | 1604 | 1465 | 1326 | 118 | 1048 | 090 | 59.077 | 47＇65 | 6736 | 6908 | 7080 | 725 | 742 | 759 | 7768 | 7940 | 硣 | 76 |
|  | 985 |  |  |  |  | ¢ 687 | 8968 | 8825 | 8684 | 59.854 | 48.28 | 300 | 31 | 33 | 3532 | 37 | 38 | 40 | 42 | 440 |  |
| 78 | 759 | 7457 | 731 | 7172 | 30 | 6887 | 6745 | 6602 | 6459 |  |  |  | 573 | 5912 | 601 |  | 164 |  |  |  | 78 |
|  | 5389 | 52 | 51 | 4956 | 12 | 4668 | 4523 | 437 | 4234 | 61．4090 | 49.537 | 5554 | 5733 | 591 | 609 | 6270 | 6448 | 66 | 6806 | 693 | 79 |
| 80 | 317 | 3033 | 2887 |  | 2594 | 2448 | 2302 | 2156 | 2010 | 863 | 50．1646 | 1827 | 2008 | 2189 | 2370 | 25 | 27 | 2914 | 3095 | 327 | 80 |
|  | 09 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8758 | 8609 | 8459 | 8309 | 8159 | 8010 | 7860 | 7710 | 7560 | 63.741 | 51.418 | 4373 | 4558 | 474 | 4930 |  |  |  |  |  | 82 |
|  | 65 | 63 | 224 |  | 42 |  | 56 | 5487 | 5335 | 64.518 | 52.045 | 06 | 0833 | 102 | 120 | 1387 | 158 | 177 | 19 | 214 |  |
|  | 433 | 18 | 403 | 3878 | 24 | 3571 | 3417 | 264 |  |  |  | 91 |  | 729 |  | 7679 | 1569 | dis | 24 |  |  |
| 85 | 212 | 197 | 181 | 1662 | 1507 | 1351 | 1196 | 104 | 0885 | 0730 | 53.299 | 319 | 338 | 357 | 376 | 396 | 415 | 434 | 453 | 473 | 85 |
| 86 | 99 | 97 | 96 | 9446 | 9289 | 132 | 8975 | 18818 | 8660 | 66．8503 | 53．92 | 946 | 965 | 9853 | －048 | 02 | 04 | 06 | 082 | 1021 | 86 |
|  | 7707 | 7548 | ， |  | ， | 13 | 6754 | 659 | 6435 | 67.627 | 54.55 | 573 | 5934 | 613 | 6328 | 65 | 672 | 6919 |  |  | 87 |
| 88 | 5497 | 5336 | 5175 | 5015 | 4854 | 4693 | 4532 | 4372 | 4211 | 68.405 | $55 \cdot 18$ | 2010 | 2209 | 2408 | 2608 | 28 | 302 | 520 | 963 |  | 88 |
| 89 | 3286 | 3124 | 276 |  |  | 474 | 2311 | 2148 | 1986 | 69．1823 | 55.808 | 8282 | 8484 | 868 | 8887 | 908 | 929 | 949 | 969 | 98 |  |
| 90 | 1076 | 0912 | 07 |  |  | 0254 | 1090 | 9925 | 9761 | 69.959 | 56.435 | 455 | 475 | 96 | 516 | 537 | 5 | 577 | 598 | 61 | 90 |
|  | 886 | ， | 853 |  | 矿 | 矿 | 析 |  | 536 |  |  | ， |  |  |  | 教 | 硡 | 2064 |  |  |  |
|  | 665 | 648 | 632 | 615 | 5984 | 5816 | 5647 | 5479 | 5311 | 71.5143 | 57.689 | 7101 | 7309 | 7518 | 7726 | 7934 | 8142 | 8351 | 855 | 876 | 92 |
|  | 444 | 27 | 1 |  |  | 1377 | 426 | 3256 | 3086 | $72 \cdot 291$ | 58 | 3374 | 3584 | 3795 | 4006 | 4216 | 4427 | 4637 | 484 | 505 | 93 |
| 94 | 223 | 206 | 189 | 172 | 1549 | 1377 | 1205 | 1033 | 0861 | $73 \cdot 0689$ | 58.9434 | 964 | 9860 | －072 | 0285 | 04 | 0711 | 0923 | 13 | ， | 94 |
| 95 | ＋02 | 9851 | 9678 | 9505 | 31 | 9157 | 8984 |  | 8636 | $73 \cdot 8463$ | 59．5704 | 592 | 6135 | 6350 | 656 | 67 | 699 | 72 | 7425 | 76 | 95 |
| 96 | 7814 | 7639 | 7464 |  | 13 |  | 6763 | 658 | 6412 |  | $60 \cdot 197$ | 2192 | 2410 | 2627 | 2845 | 3062 | 3279 | 3496 | 3713 | 393 | 96 |
| 97 | 563 | 54 | 525 | 5073 | 4896 | 419 | 454 | 4364 | 4187 | 754009 | 60＇8245 | 8465 | 8685 | 8905 | 9124 | 9344 | 9563 | 783 | 200 | 2 | 97 |
| 98 | 339 | 321 | 303 | 28 | 2678 | 2499 | 2320 | 2141 | 1962 | 76.1782 | 61.4516 | 4738 | 4960 | 5182 | 5404 | 5626 | 58 | 606 | 629 | 65 | 98 |
|  |  | 1073 | O82 | 064 | 0461 | 80 |  | 9918 | 9737 | 76.9556 | 62.0787 | 1011 | 1235 | 1459 | 1683 | 1908 | 2132 | 2356 | 258 | 280 | 99 |
| 100 | 8973 | 8791 | 8608 | 8426 | 8243 | 60 | 78 | 7695 | 7512 | 77.732 | $62 \cdot 7057$ | 7284 | 510 | 7737 | 7963 | 8189 | 3416 | 8642 | 8868 | 9094 | 100 |
|  | $10^{\prime}$ | $9^{\text { }}$ | $8^{\prime}$ | $7^{\prime}$ | $16^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ | $1^{1}$ | 10 |  | $8^{\prime}$ | $7{ }^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | SINE |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| Cosine． |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $39^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11^{\prime}$ | 12 | 13 | $4^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ | 17 | $18^{\prime}$ | 19 | $10^{\prime}$ | $11^{\prime}$ | $12{ }^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ | 17 | 18 |  |  |
|  | 775 | 775 | 77 | 7748 | 7746 | 774 | 7742 | 77 | 77 | 7737 | 6316 | 6318 | 6320 | 6323 | 6325 | 6327 | 6329 | 6332 | 6334 | 6336 |  |
| 2 | 5506 | 550 | 549 | 5495 | 5492 | 5488 | 5484 | 5480 | 547 | 1.5473 | $1 \cdot 2632$ | 2636 | 2641 | 2645 | 26 | 2654 | 2659 | 2663 | 8 | 2672 | 2 |
|  | 3259 | 325 | 32 | 3243 | 3237 | 3232 | 3226 | 3221 | 32 | 2.3210 | 1.894 | 89 | 89 | 89 | 8974 | 89 | 8988 | 89 |  |  |  |
|  | 1012 | 1005 | 0998 | 0990 | 0983 | 0976 | 0968 | 961 | 0954 | 3.0946 | $2 \cdot 526$ | 527 | 528 | 52 | 5299 | 5308 | 531 | 532 | 533 | 5344 |  |
| 5 | 8766 | 8756 | 8747 | 8738 | 8729 | 8720 | 8710 | 8701 | 8692 | 3.8683 | 3.1579 |  | 160 | 161 | 1624 | 1635 | 1647 | 1658 | 166 | 1680 |  |
| 6 | 6519 | 6508 | 64 | 6486 | 647 | 6464 | 6453 | 644 | 64 | 4.64 | 78 | 7908 | 79 | 79 | 79 | 7962 | 7976 | 7989 | 8003 | 8016 |  |
|  | 4272 | 425 | 42 | 423 | 422 | 420 | 4195 | 4182 | 4169 | 5.415 | 4.4210 | 42 | 42 | 4258 | 4274 | 4289 | 4305 | 4321 | 37 | 252 |  |
|  | 2025 | 2010 | 19 | 1981 | 196 | 1951 | 1937 | 1922 | 1907 | $6 \cdot 18$ | ， | 0544 | 056 | 0580 | 0598 | 0616 | 0634 | 065 | 067 | 06 |  |
|  | 9778 | 9762 |  | 9728 | 9712 | 9695 | 9679 | 9662 | 964 | 6．962 | 6842 | 686 | 6883 | 69 | 692 | 6943 | 6964 | 6984 | 700 | 70 |  |
| 10 | 7531 | 7513 | 749 | 747 | 7458 | 7439 | 7421 | 402 | 7384 | 73 | 15 | 318 | 320 | 32 | 32 | 3271 | 329 | 331 | 333 | 33 |  |
| 11 | 5284 | 5264 | 524 | 52 | 5203 | 5183 | 5163 | 5143 | 51 | 8.5102 | 947 | 9498 | 9523 | 9548 | 9573 | 9598 | 9622 | 9647 | 9672 | 969 | 11 |
| 12 | 3037 | 301 | 29 | 2971 | 2949 | 2927 | 2905 | 2883 | 286 | 28 | $7 \cdot 578$ | 581 | 584 | 58 | 58 | 59 | 5952 | 597 | 6006 | 603 | 12 |
| 13 | 0791 | 076 | 07 | 07 | 0695 | 067 | 0647 | 0623 | 05 | 10.057 | 8.2105 | 21 | 216 | 2193 | 2222 | 2252 | 2281 | 2310 | 2340 | 236 | 13 |
| 14 | 8544 | 851 | 8492 | 8466 | 41 | 841 | 8389 | 8363 | 833 | 10.8312 | 42 | 845 | 84 | 85 | 85 | 85 | 8610 | 86 | 8673 | 8705 | 14 |
| 15 | 6297 |  |  |  |  | 61 |  | 6104 | 607 | 11.6048 | 37 | 4771 | 48 | 48 | 487 | 49 | 4940 | 4973 | 500 | 50 | 15 |
| 16 | 40 | 4021 | 3991 | 3962 | 3932 | 3903 | 3873 | 3844 | 3814 | 12 | $10 \cdot 10$ | 1089 |  |  |  |  | 269 |  |  |  | 16 |
| 17 | 180 | 177 | 1741 | 1709 | 1678 | 164 | 1615 | 15 | 15 | 13.15 | 10.73 | 740 | 744 | 7483 | 7522 | 7560 | 7598 | 76 | 7675 |  | 17 |
| 18 | 95 | 9523 |  | 9457 |  | 9391 | 源 | 932 | 929 | 13.92 | 11 | 37 | 3765 | 38 | 3846 | 388 | 39 | 39 | 400 | 4049 | 18 |
| 19 | 7309 | 727 | 72 | 7205 |  | 135 | 100 | 265 | 703 | 14．699 | 12.00 | 00 | 008 | 012 | 017 | 0214 | 02 | 0300 | 0342 | 038. | 19 |
| 20 | 5062 | 5026 | 498 | 495 | 4915 | 4879 | 4842 | 4805 | 4768 | 15.4731 | 12.6316 | 636 | 6406 | 645 | 6496 | 654 | 6586 | 663 | 667 | 672 | 20 |
| 21 | 281 | 27 | 2738 | 2700 | 2661 | 26 | 2584 | 254 | 250 | 16 | 13. | 2679 | 2726 | 2773 | 2821 | 2868 | 29 | 2963 | 3010 | 305 | 21 |
|  | 0569 | 0528 |  |  | 2407 | 0366 | 0326 | 0285 | 0245 | 17 | 13 | 899 | 904 | 90 | 91 | 9195 | 92 | 929 | 9344 | 93 | 22 |
| 23 | 8322 | 8280 | 823 | 81 | 8153 | 8110 | 8068 | 8026 | 7983 | $17 \cdot 79$ | 14.52 | 53 | 53 | 54 | 54 | 55 | 557 | 56 | 5678 | 57 | 23 |
| 24 | 6075 | 603 | 598 | 5943 |  | 5854 | 5810 | 5766 | 572 | 18.56 | 15.15 | 16 | 168 | 17 | 1795 | 184 | 190 | 1957 | 201 | 206 | 24 |
| 25 | 3828 | 378 |  |  |  | 98 |  | 3506 |  | 19.341 | $15 \cdot 7895$ |  | 800 | 8064 | 8120 | 817 | 823 | 228 | 83 | 8401 | 25 |
| 26 | 1581 | 15 | 1486 | 1438 | 1390 | 1342 | 1294 | 1246 | 1198 | 20.1 | 16 | 426 | 4328 | 4386 | 4445 | 4503 | 4562 | 4620 |  |  | 26 |
| 27 | 9334 | 928 | 923 | 9185 | 9136 | 9086 | 9036 | 898 | 89 | 20.88 | 17.0 | 05 | 064 | 0709 | 0770 | 0830 | 0891 | 0952 | 10 | 107 | 27 |
| 28 | 7087 | 703 | 69 | 6933 | 6881 | 6830 | 6778 | 6727 | 6675 | 21.66 | 17．68 | 69 |  | 70 | 70 | 71 | 722 | 728 | 734 | 741 | 28 |
| 29 | 4841 | 478 | 473 | 4681 | 4627 | 4574 | 4520 | 4467 | 44 | 22.4 | $18 \cdot 3$ | 32 | 3288 | 33 | 3419 | 348 | 355 | 361 | 368 | 37 | 29 |
| 30 | 2594 | 2538 | 24 | 28 | 373 | 2318 | 2263 | 2207 | 2152 | 23．20 | 18.9474 | 954 | 96 | 96 | 974 | 981 | 987 | 994 | －01 | 008 | 30 |
| 31 | 0347 | 0290 | 0233 | ${ }^{0176}$ | 0119 | 0062 | －005 | 9948 | 9890 | 23.9833 | 19.5789 | 585 | 5929 | 599 | 6069 | 6139 | 620 | 6278 | 6348 | 6418 | 31 |
| 32 | 8100 | 804 | 7 | 7923 | 7865 | 7806 | 7747 | 7688 | 762 | 24.757 | 20210 |  |  | 23 | 2394 | 2466 | 2538 | 261 | 2682 | 275 | 32 |
| 33 | 585 | 5792 | 573 | 56 | 5610 | 50 | 5489 | 428 | 5367 | $25 \cdot 53$ | 20 | 84 | 8570 | 86 | 8718 | 879 | 886 | 894 | 901 | 909 | 33 |
| 34 | 360 | 3544 | 348 | 341 | 3356 | 3293 | 3231 | 3168 | 31 | $26 \cdot 30$ | 21.473 | 481 | 48 | 49 | 5043 | 512 | 519 | 527 | 53 | 542 | 34 |
| 35 | 1359 | 1295 |  |  | 1102 | 1037 | 73 |  |  |  | 22．1052 |  | 121 | 1289 | 1368 | 144 | 152 | 1604 | 1683 |  | 35 |
| 36 | 9112 | 904 | 89 | 891 | 8848 | 8781 | 8715 | 8649 | 8582 | $27 \cdot 85$ | 22.73 | 7449 | 753 | 7612 | 769 | 777 | 785 | 793 | 801 |  | 36 |
| 37 | 686 | 679 | 67 | 66 | 6593 | 652 | 6457 | 6389 |  | $28 \cdot 625$ | 23 | 376 |  | 393 | 4018 | 410 | 418 | 426 | 435 | 443 | 37 |
| 38 | 4619 | 45 | 44 | 44 | 4339 | 42 | 199 | 4129 | 40 | 29.39 | 24.00 |  | 017 | 0 | 03 | 042 | 051 | 059 | 068 | 7710 | 38 |
| 39 | 2372 | 230 | 2228 | 21 | 2085 | 20 | 94 | 1870 | 17 | $30 \cdot$ | $24 \cdot 6316$ | 64 | 6491 | 65 | 6667 | 67 | 6843 | 693 | 701 | 710 | 39 |
| 40 | 0125 | －051 | 9978 | 9904 | $31)$ | 57 | 9683 | 9610 | 9536 | 30．9462 | $25^{\circ}$ | 272 | 2812 | 290 | 2992 | 308 | 317 | 326 | 335 | 344 | 40 |
| 41 | 7878 | 7803 | 7727 | 7652 | 7576 | 750 | 7426 | 7350 | 727 | 31.719 | 25.8947 |  |  |  | 9317 | 9409 | 9502 |  |  |  | 41 |
| 42 | 5631 | 555 | 54 | 539 | 5322 | 5245 | 5168 | 509 | 501 | 32－49 | 2 |  |  |  |  | 57 | 583 | 592 |  |  | 42 |
| 43 | 338 | 33 | 32 | 31 | 3068 | 2989 | 2910 | 28 | 27 | 33 | 27 | 1676 | 1773 | 1 |  | 2063 | 216 | 225 | 2354 | 245 | 43 |
| 44 | 1137 | 105 | 097 | 0895 | 0814 | 0733 | 0652 | 057 | 0490 | 34 | 27 | 799 | 80 | 81 | 82 | 839 | 848 | 858 | 868 | 878 | 44 |
| 45 | 8890 |  | 872 |  |  | 8477 | 394 | 8311 | 8228 | 34 | 42 | 4312 | 4413 |  |  | 471 | 4819 | 4920 |  | 123 | 45 |
| 46 | 66 | 65 | 6474 | 6390 |  | 6221 | 6136 | 6051 | 5966 |  | 29.05 | 06 | 07 |  | 09 | 104 | 1148 | 125 |  |  | 46 |
| 47 | 439 | 43 | 42 | 41 |  | 3965 | 3878 |  | 3705 | $36 \cdot 36$ | 29 |  |  |  | 72 | 737 | 747 |  |  |  | 47 |
| 48 | 2150 | 2062 | 1973 | 18 | 1797 | 17 | 16 | 1532 | 144 | $37 \cdot 13$ | 30 |  | 3374 | 3482 | 35 | 369 | 380 | 3915 | 4023 | 4131 | 48 |
| 49 | 990 | 9813 | 97 | 96 | 9543 | 94 | 93 | 927 | 918 | 37－909 | 30 |  |  |  | 99 | －02 | 013 | 02 |  | 0467 | 49 |
| 50 | 765 | 7564 | 7472 | 7380 | 7288 | 7196 | 7104 | 12 | 6920 | 38.6828 | 31.578 | 5902 | 6015 | 612 | 6240 | 6353 | 646 | 657 | 6690 | 6803 | 50 |
|  | 5409 | 5315 | 5222 | 5128 | 5034 | 4940 | 4846 | 52 | 4659 | 39 | 32.210 |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 3162 | 306 | 297 | 287 | 278 | 26 | 258 | 249 | 239 | $40^{\circ} 2301$ | 32.842 | 85 | 865 |  | 88 | 900 | 9124 | 924 | 935 | 947 | 52 |
| 53 | 0915 | 081 | 072 | 06 | 0526 | 0428 | 0331 | 0233 | 0135 | $41^{\circ} 0038$ | 33.473 | 485 |  | 50 | 5214 | 5334 | 5453 | 557 |  | 58 | 53 |
| 54 | 8669 | 8569 | 847 | 83 | 827 | 8172 | 8073 | 7973 | 7874 | 41.7774 | $34 \cdot 105$ | 117 | 129 | 1418 | 1539 | 166 | 1783 | 190 |  |  | 54 |
| 55 | 6422 | 632 |  |  | 6017 | 59 | 5815 | 5713 | 5612 | 42.5511 | 34. | 7492 | 761 | 774 | 7864 |  | 砛 | 8236 | 835 | 8483 | 55 |
| 56 | 417 | 407 |  |  |  |  | 3557 | 345 | 335 |  | 35 | 38 | 39 | 406 | 41 |  | 44 | 45 | 469 | 4819 | 56 |
|  | 192 | 1823 |  | 161 |  | 1404 | 1299 | 1194 | 1089 | 44.0984 | 36.000 | 0128 | 025 |  |  | 064 | 0770 | 089 | 102 |  | 57 |
| 58 | 9681 | 9574 | 9468 | 93 | 925 | 9148 | 904 | 8934 | 8827 | 44.872 | 36.63 | 64 | 657 | 670 | 6838 | 696 | 710 | 723 | 736 | 749 | 58 |
| 59 | 7434 | 7326 | 72 |  |  | 6892 | 6783 | 6674 | 6566 | 45.6457 | 37．263 |  | 289 | 303 | 3163 | 329 | 3429 | 356 | 369 | 3827 | 59 |
| 60 | 5187 | 5077 | 4967 | 4856 | 4746 | 4636 | 4525 | 4415 | 304 | 46.4194 | $37 \cdot 8947$ | 9082 | 921 | 93 | 9488 | 62 | 9758 | 989 | 102 |  | 60 |
|  | 294 | 2828 | 271 |  |  |  | 22 | 215 | 2043 | $47 \cdot 1930$ | 38 |  |  |  |  |  |  |  |  |  | 61 |
| 62 | 06 | 058 | 046 |  |  | 012 | －009 | 989 | 978 | $47 \cdot 9667$ | 39．15 |  | 185 | 193 | 21 | 227 | 24 | 255 | 269 | 28 | 62 |
| 63 |  | 8331 |  |  |  |  | 7751 | 7635 | 7519 | 48.7403 | 39.789 | 803 | 8178 | 832 | 846 | 8604 | 87 | 88 | 9030 |  | 63 |
| 64 | 6200 | 6082 | 5964 |  | 572 | 561 | 5494 | 5376 | 5258 | 49.5140 | $40 \cdot 42$ | 4354 | 449 | 46 | 478 | 493 | 507 | 5220 | 536 |  | 64 |
| 65 | 3953 | 3833 | 3714 | 35 | 3475 | 3355 | 3236 | 31 | 2 | 50.2876 | 41.0526 |  |  |  | 111 | 1258 | 40 | 155 | 169 |  | 6 |
| 66 | 1706 | 1585 | 14 |  |  |  |  |  | 0735 | 51.0613 |  |  |  |  | 743 | 7585 |  | 788 | －31 |  | 66 |
| 6 | 9459 |  |  |  |  |  | 87 |  | 821 | 51．8349 | 42315 |  |  |  |  | 2918 |  | 21 | 4 |  | 67 |
| 68 | 721 | 7087 | 696 | 68 | 67 | 65 | 6462 | 633 | 621 | 52．6086 | 42.947 | 962 | 97 | 993 | －08 | 02 | 039 | 054 | 06 | 08 | 68 |
| 69 |  |  |  |  |  | 4331 |  | 4077 | 3950 | 53．3823 | 43.578 | 594 | 6100 | 23 |  | 656 | 6722 | 687 | 7033 | 718 | 69 |
| 70 | 2718 | 590 | 2461 | 2332 | 220 | 2075 | 1946 | 1817 | 168 | 54.155 | $44 \cdot 210$ | 226 | 242 | 257 | 273 | 289 | 305 | 320 | 3367 | 3524 | 70 |
| 7 | 0472 | 481 | 02 | P080 | 9949 | 9819 | 9688 | 9557 | 9427 | 54. | $44 \cdot 842$ | 858 | 874 | 89 | 906 | 922 | 93 | 954 | 970 |  | 71 |
| 72 | 8225 | 8092 | 7960 |  | 76 | 7563 | 7430 | 7298 | 7165 | 55＇7032 | 45.473 | 489 | 506 | 52 | 538 | 5548 | 57 | 5872 | 603 | 619 | 72 |
| 73 | 5978 | 5844 | 570 | 5575 | 5441 | 5307 | 5172 | 5038 | 4903 | 56.4769 | 46－105 | 1217 | 1381 |  | 173 | 187 |  |  | 236 | 25 | 73 |
| 74 | 3731 | 3595 | 3459 | 3323 | 31 | 30 | 29 | 2778 | 2642 | 57.2505 | 46．7368 | 7535 | 7702 | 7868 | 803 | 8202 | 8369 | 8535 | 8702 | 886 | 74 |
| 75 | 1484 | 13 | 1208 | 10 |  |  |  | 0518 | 0380 | 8．0242 | 47－3684 | 3853 | 4022 | 419 | 4360 | 45 | 4698 | 4867 | 36 | 52 | 75 |
| 76 | 9237 | 9098 | 8958 |  |  |  |  |  | 81 | 798 | $48^{\circ}$ | 017 | 0342 |  |  | 0856 |  |  |  |  | 76 |
| 77 | 6990 | 6849 | 6707 | 6566 | 6424 | 6282 | 614 | 5999 | 5857 | 59.5715 | $48^{\circ} 631$ | 648 | 6663 | 683 | 7010 | 7183 | 73 | 7530 |  |  | 77 |
| 78 | 4743 | 4600 | 4457 | 4313 | 4170 | 4026 | 3883 | 3739 | 3595 | $60 \cdot 3452$ | 49.263 | 2807 | 2983 | 315 | 333 | 35 | 3686 | 386 | 4037 | 4213 | 78 |
| 79 | 2497 | 2351 | 2206 | 2061 | 1916 | 1770 | 1625 | 1479 | 1334 | 61.1188 | $49 \cdot 8947$ | 9125 | 930 | 481 |  | 983 | 1015 | 0193 | 0371 | 054 | 79 |
| 80 | 0250 | －103 | 9956 | 9808 | 9661 | 95 | 93 | 9220 | 9072 | 61．8925 | $50 \cdot 5263$ | 544 | 562 | 580 | 598 | 616 | 634 | 652 | 670 | 688 | 80 |
| 81 | 800 | 78 | 77 | 7556 | 74 | 72 | 7109 | 6960 | 6811 | 62.6661 | 51.1579 | 176 | 1944 | 212 | 230 | 249 | 2674 | 285 | 303 | 32 | 81 |
| 82 | 5756 | 5605 | 5454 | 5304 | S | 5002 | 4851 | 4700 | 4549 | 63＇4398 | 51．789 | 807 | 8264 | 844 | 863 | 881 | 900 | 918 | 937 | 95 | 82 |
| 83 | 3509 | 3356 | 3204 | 3051 | 289 | 2746 | 2593 | 2440 | 2287 | $64 \cdot 2134$ | 52．421 | 439 | 458 | 477 | 4958 | 5145 | 5332 | 5519 | 570 |  | 83 |
| 84 | 1262 | 1108 | 0953 | 0799 | 迷 | 0490 | 0335 | 0180 | －026 | 64.9871 | 53．0526 | 0715 | 0905 | 109 | 1283 | 147 | 166 | 185 | 2040 | 222 | 84 |
| 85 | 9015 | 8859 | 8703 | 8547 | 8390 | 8234 | 807 | 7921 | 7764 | $65 \cdot 7608$ |  | 7033 |  | 741 | 7608 | 7800 | 799 | 8182 | 8374 | 8565 | 85 |
| 86 | 6768 | 6610 | 6452 | 6294 | 6136 | 5978 | 5819 | 5661 | 5503 | $66 \cdot 5344$ | 54．315 | 335 | 3545 | 寿 | 3933 | 仡 | 435 | 451 |  |  | 86 |
| 87 | 4522 | 4362 | 4202 | 404 | 3882 | 3722 | 356 | 3401 | 3241 | 67.308 | 54：9473 | 966 | 986 | －06 | 0258 | 0454 | 06 | 0845 | 104 | 123 | 87 |
| 88 | 2275 | $2{ }^{2} 1$ | 9701 |  | － 717 | 1465 | 1304 | 114 | 0979 | $68^{\circ} 0817$ | 55.5789 | 5987 | 6186 | 638 | 6582 | 678 | 697 | 7177 | 7375 | 矿 | 8 |
| 89 | －028 | 9864 | 9701 | 95 | 937 | 9209 | 9046 | 8882 | 8718 | 68．8554 | 56.2105 | 2305 | 2506 | 2707 | 2907 | 3108 | 3308 | 3509 | 3709 | 3909 | 89 |
| 90 | 778 | 15 | 7450 | 7285 | 7119 | 695 | 678 | 6622 | 6456 | 69.6290 | 56.8421 | 8624 | 882 | 929 | 9232 | 943 | 963 | 984 | ．04 | 024 |  |
| 91 | 55 | 53 | 51 | 5032 | 4 | 4697 | 4530 | 202 | 4195 | 70．4027 | 57．473 | 4942 | 514 | 535 | 55 | 5762 | 596 | 6172 | 6377 |  | ， |
| 92 | 328 | 31 | 29 | 2780 | 2611 | 24 | 2272 | 2102 | 1933 | 71.1763 | 58．1052 | 1260 | 146 | 167 | 188 | 208 | 2296 | 2503 | 271 | 217 | 92 |
| 93 | 1040 | 0869 | 0698 | 0527 | 0356 | 0185 | －014 | 9843 | 9671 | 71.9500 | 58．7368 | 7578 | 7787 | 7997 | 8206 | 841 | 86 | 8835 | 90 | 92 | 93 |
| 94 | 8793 | 8621 | 8448 | 8275 | 8102 | 185 |  | 7583 | 7410 | $72 \cdot 7237$ | 59 3684 | 3896 | 4108 | 4319 | 4531 | 4743 | 4955 | 516 | 5378 | 559 | 94 |
| 95 | 6546 | 6372 | 61 | 6023 | 58 | 567 | 5498 | 5323 | 5148 | $73 \cdot 4973$ | 59．9999 | ＋214 | 0428 | 0642 | 0856 | 107 | 128 | 149 | 1712 | 5s0 | 95 |
| 96 | 4300 | 4123 | 3947 | 37 | 3594 | 3417 | 3240 | 63 | 2887 | $74 \cdot 2710$ | $60^{\circ} 6315$ | 6532 | 6748 | 696 | 718 | 739 | 7613 | 7829 | 8046 | 826 | 96 |
| 97 | 2053 | 1874 | 1696 | 1518 | 1339 | 1161 | 0982 | 0804 | 0625 | 75.0446 | 61.2631 | 2850 | 3068 | 3287 | 3506 | 3724 | 3943 | 4161 | 4379 | 459 | 97 |
| 98 | 980 | 9626 | 9446 | 926 | 9085 | 8905 | 8724 | 8544 | 8363 | 75.8183 | 61.8947 | 9168 | 9389 | 9510 | 9830 | ＋051 | 2721 | 0493 | 0713 | O93 | 98 |
| 99 | 7559 | 7377 | 7195 | 7013 | 6831 | 6649 | 6467 | 6284 | 6102 | 76.5919 | 62．5263 | 5486 | 5709 | 5932 | 6155 | 6378 | 6601 | 6824 | 7047 |  | 99 |
| 100 | 5312 | 5128 | 4945 | 4761 | 4577 | 4393 | 4209 | 4024 | 3840 | 77.3656 | $63 \cdot 1578$ | 1804 | 2029 | 2255 | 2480 | 2705 | 2931 | 3156 | 3381 | 3606 | 100 |
|  | $50^{\prime}$ | $49^{\prime}$ | 48 | 47 | $46^{\prime}$ | 45 | 44 | $43^{\prime}$ | $42^{\prime}$ | $41^{\prime}$ | 50 | $49^{\prime}$ | $48^{\prime \prime}$ | $47^{\prime}$ | 46 | 45＇｜ |  |  |  |  |  |
| $50^{\circ}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | NE |  |  |  |  |  |

TRAVERSE TABLES．

| $39^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $39^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | 21 | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | $27^{\prime}$ | $28^{\prime}$ | $29^{\prime}$ | $20^{\prime}$ | 21 | 22 | 23 | $24^{\prime}$ | 25 | $26^{\prime}$ | $27^{1}$ | $28^{\prime}$ | ${ }^{2}$ |  |
|  | 773 | 7733 | 7731 | 77 | 7727 | 7725 | 7724 | 7722 | 7720 | 77 | 6338 | 6341 | 6343 | 634 | 6347 | 6350 | 6352 | 6354 | 6356 | 6359 |  |
|  | 546 | 5466 | 5462 | 54 | 5455 | 5451 | 5447 | 5444 |  | －543 | 267 | 268 | 26 | 26 | 2695 | 26 | 2704 | 27 | 2713 |  |  |
| 3 | 3204 | 3199 | 3193 | 318 | 3182 | 3176 | 317 | 3165 | 3160 | $2 \cdot 315$ | 9015 | 9022 | 90 | 9035 | 9042 | 9049 | 9055 | 9062 | 9069 |  |  |
| 4 | 093 | 0931 | 0924 | 0917 | 0909 | 0902 | 0895 | 0887 |  | 3． | 2.5 | 5362 | 537 | 5380 |  | 539 | 5407 | 54 | 5425 | 543 |  |
| 5 | 867 | 668 | 8655 | 964 | 863 | 8627 | 8618 |  |  | $3 \cdot 8590$ |  | 170 | 17 | 172 | 1737 | 1748 | 1759 | 177 | 178 | 179 |  |
| 6 | 6408 | 6397 | 6386 | 6375 | 6364 | 6353 | 6342 | 6331 | 6320 | 4.6309 | 3.8030 | 8043 | 8057 | 8070 | 8084 | 8097 | 8111 | 8124 |  |  |  |
| 7 | 4143 | 4130 | 411 | 410 | 4091 | 407 | 4065 | 4053 | 4040 |  | 44368 | 43 | 44 | 44 | 44 | 4447 | 446 | 4478 | 4494 | 451 |  |
| 8 | 1878 | 1863 | 18 | 18 | 18 | 1804 |  | 1774 |  | 174 | ． 070 | 070 | 07 | 07 | 077 | 0796 | 0814 | 083 | 0850 | 08 |  |
|  | 961 | 9596 | 9579 | 956 | 954 | 95 | 9513 | 949 | 948 | 6.9 | 5.704 | 70 | 70 | 71 | 7126 | 7146 | 71 | 71 | 7207 | 722 |  |
| 10 | 7347 | 7329 | 7310 | 7292 | 73 | 55 | 7236 | 7218 | 7199 | 7.7181 | 6.3383 | 3406 | 342 | 345 | 3473 | 34 | 351 | 3540 | 3563 | 358 | 0 |
| 11 | 5082 | 506 | 50 | 5021 | 5001 | 49 | 4960 | 4940 | 49 | 8＊ 4899 | 6.9721 | 9746 | 9771 | 97 | 98 | 98 | 987 | 9895 | 9919 | 994 | 11 |
| 12 | 2817 | 2794 | 2772 | 27 | 2728 | 2706 | 2684 | 2662 | 2639 | 2617 | $7 \cdot 6060$ | 6087 | 611 | 61 | 61 | 6195 | 6222 | 62 | 627 | 630 | 12 |
| 13 | 0551 | 0527 | 0503 | 04 | 0455 | 043 | 0407 | 0383 | 03 | 10.03 | 8.2398 | 242 | 2457 | 2486 | 2515 | 25 | 257 | 26 | 263 | 26 | 13 |
| 14 | 828 | 8260 | 2034 | 8209 | 8183 | 8157 | 8131 | 8105 | 8079 | 10.80 | 8.8736 | 876 | 87 | 883 | 8862 | 88 | 892 | 895 | 898 | 902 | 14 |
| 15 | 6021 |  |  |  | 5910 |  |  | 5827 | 5799 | 11.577 | 9 | 510 | 51 | 517 | 5210 | 5243 | 5277 | 531 | 534 | 537 | 15 |
| 16 | 37 | 3726 | 3696 | 3667 | 3637 | 3608 | 3578 | 3549 | 3519 | 12.3490 | 10.1413 | 1449 | 1485 | 1521 | 1557 | 1593 | 1629 | 1665 |  |  | 16 |
| 17 | 149 | 145 | 142 | 139 | 136 | 133 | 1302 | 127 | 12 | $13 \cdot 12$ | $10 \cdot 77$ | 77 | 78 | 78 | 7904 | 79 | 79 | 801 | 8057 | 80 | 17 |
| 18 | 9225 | 9192 | 91 | 912 | 909 | 9059 | 9026 | 8992 | 89 | $13 \cdot 89$ | 11.40 | 413 | 417 | 42 | 42 | 429 | 4332 | 437 | 44 | 445 | 18 |
| 19 | 6960 | 692 | 689 | 685 | 68 | 678 | 6749 | 714 | 667 | 14．66 | 12.0 | 047 | 05 | 0556 | 059 | 064 | 068 | 072 | 07 | 08 | 19 |
| 20 | 4694 | 4657 | 4621 | 4584 | 454 | 4510 | 4473 | 4436 | 4399 | 15.4 | 12.6766 | 6811 | 685 | 690 | 6946 | 69 | 703 | 708 | 712 | 717 | 20 |
| 21 | 24 | 23 | 2352 | 2313 | 2274 | 2235 | 219 | 2158 | 2119 | 16 | 13.3105 | 3152 | 3199 | 3246 | 3293 | 3341 | 3388 | 3435 | 3482 | 3529 | 21 |
| 22 | 0 | 0123 | 00 | 0042 | 100 | 99 |  | 9879 | 98 | 16 | 13.944 | 949 | 9542 | 9591 | 96 | 969 | 9740 | 97 |  | 98 | 22 |
| 23 | 789 | 78 | 7814 | 7771 | 772 | 76 | 7644 | 501 | 75 | 1775 | 14.57 | 58 | 58 | 59 | 59 | 60 | 60 | 61 | 61 | 62 | 23 |
| 2 | 563 | 55 | 5545 | 5500 | 5 | 5412 |  | 5323 | 5279 | 18.52 | 15.21 | 21 | 22 |  | 23 | 23 | 244 | 249 | 255 | 26 | 24 |
| 25 | 336 | 3322 | 327 |  |  |  |  |  | 2999 | 19.295 | 15845 | 85 |  | 8626 | 8683 | 8739 | 3795 | 885 | 890 | 896 | 25 |
| 26 | 1103 | 1055 | 1007 |  | 09 | 0863 | 0815 | 0767 | 0719 | 20.0670 | 16 | 4855 | 491 | 497 | 5030 | 5088 | 5147 | 520 |  |  | 26 |
| 27 | 8837 | 8788 | 873 | 8688 | 86 | 85 | 8538 | 8488 | 8439 | 20 | 17 | 119 | 125 | 13 | 13 | 14 | 14 | 155 | 162 | 168 | 27 |
| 28 | 6572 | 65 | 64 | 6417 | 63 | 63 |  | 62 | 6158 | $21 \cdot 610$ | 17747 | 75 | 75 | 76 | 77 | 77 | 785 | 791 | 797 | 803 | 28 |
| 29 | 430 | 4253 | 4200 | 4146 | 4093 | 4039 |  | 3932 | 3878 | 22 |  | 38 | 39 | 400 | 40 | 413 | 4202 | 426 | 433 | 439 | 29 |
| 30 | 204 | 1986 | 1931 | 1875 | 1820 | 1765 | 1709 | 654 | 1598 | $23 \cdot 15$ | 19.0149 | 0217 | 028 | 035 | 041 | 0487 | 055 | 062 | 068 | 075 | 30 |
| 31 | 9776 | 9719 | 9662 | 9605 | 9547 | 9490 | 9433 | 9376 | 9318 | 23 | $19 \cdot 6488$ | 6557 | 6627 | 6697 | 6766 | 6836 | 6906 | 6975 | 7045 | 7115 | 31 |
| 32 | 75 | 7452 | 7393 | 7334 | 7275 | 721 |  | 7097 | 38 | 24 | 20 | 289 | 29 | 3042 | 31 | 31 | 3258 | 33 | 3401 | 34 | 32 |
| 33 | 524 | 5185 | 5124 | 5063 | 500 | 49 | 4880 | 481 | 475 | 25.46 | 20 | 923 | 93 | 93 | 94 | 95 | 96 | 968 | 975 |  | 3 |
| 34 | 2980 | 29 | 18 | 2792 | 27 | 2667 |  | 25 | 2478 | $26 \cdot 24$ | 21.55 | 557 |  | 57 | 58 | 58 | 59 | 603 | 611 | 619 | 34 |
| 35 | 07 | 0651 | 0586 | 052 | 045 |  |  |  | 0198 | $27^{0133}$ | $22 \cdot 1841$ | 1920 | 198 | 2077 | 2156 | 2234 | 2313 | 2392 | 247 | 2549 | 35 |
| 36 | 8450 | 83 | 8317 | 825 | 8184 | 8118 |  |  | 7918 | 27.785 | 22.8179 | 826 |  |  |  |  |  | 3746 |  |  | 36 |
| 37 | 6184 | 61 | 60 |  |  | 584 |  |  | 5638 | 28. | 23 | 46 | 468 |  | 48 | 4933 | 5017 | 51 | 518 | 52 | 37 |
| 38 | 3919 | 38 | 3779 | 3709 | 363 |  | 3498 | 3428 | 33 | 29.32 | 24.08 | 094 | 102 | 11 | 119 | 12 | 1368 | 145 | 153 | 16 | 38 |
| 39 | 1654 | 1582 | 1510 | \％38 | 1366 | 12 |  |  | 1078 | 30．10 | 24 ＇719 | 28 | 737 |  | 75 | 763 | 772 | 780 | 789 | 798 | 9 |
| 40 | 9389 | 9315 | 9241 | 9167 | 9093 | 9020 | 46 | 8872 | 8798 | 30．8724 | $25 \cdot 3532$ | 362 | 371 | 3802 | 389 | 398 | 4072 | 416 | 425 | 43 | 40 |
| 41 | 7123 | 7048 | 6972 | 6896 | 6821 | 6745 | 6669 | 6594 | 6518 | 31．6442 | $25 \cdot 9871$ | 9963 | 105 | 0147 | 0240 | 0332 | 0424 | 0516 | 0608 | 070 | 41 |
|  | 485 | 4781 | 4703 | 4626 | 4548 | 447 | 4393 | 4315 | 42 | 32 | 26.6209 | 6303 | 639 | 649 | 6587 | 6681 | 6 | 6870 | 6964 |  | 42 |
| 43 | 2593 | 251 | 243 | 23 | 227 | 21 | 21 | 203 | 1958 | 33．18 | 27 | 26 | 274 | 28 | 29 | 3031 | 3127 | 322 | 332 | 341 | 43 |
| 44 | 032 | 02 | 01 | 008 | 1003 |  | 98 | 9759 | 9678 | 33．95 | $27 \cdot 88$ | 898 | 908 | 918 | 928 | 93 | 947 | 957 | 967 | 977 | 44 |
| 45 | 806 | 7979 | 7896 | 7813 | 7730 |  |  | 7481 | 7398 | 34.7314 | 28 | 5325 | 542 | 5528 | 5629 | 5730 | 5831 | 5932 | 6033 | 613 | 45 |
| 46 | 5797 | 5712 | 5627 | 5542 |  | 537 | 5288 | 5203 | 5117 | 35. | 29 | 166 | 176 | ¢ | 1976 | 20 | 83 | 228 | 2389 |  | 46 |
| 47 | 353 | 34 | 33 |  |  |  |  |  | 28 | $36^{\prime}$ |  | 800 | 811 | 821 | 83 | 8429 |  | 864 | 876 | 88 | 47 |
| 48 | 126 | 11 | 10 | 1001 | 0912 | 0823 | 07 | 0646 | 0557 | 37．04 | 30．423 | 43 | 445 | 456 | 467 | 47 | 488 | 499 | 510 | 52 | 48 |
| a | 9001 | 891 | 8820 | 8730 |  | 8549 | 84 | 836 | 8277 | 37. | 31.057 | 068 | 0798 | 0908 | 1018 | 1128 | 1238 | 1348 | 1458 | 1568 | 49 |
| 50 | 6736 | 6644 | 6551 | 6459 |  | 627 | 6182 | 6090 | 5997 | 38.5905 | 31．6916 | 7028 | 7140 | 7253 |  | 7478 |  | 770 | 8815 | 792 | 50 |
| 51 | 447 | 4376 | 4282 | 4188 |  | 4000 | 3906 | 3811 | 3717 | 39.3623 |  |  | 3483 |  |  |  |  |  |  |  | 51 |
|  | 220 |  | 20 |  |  |  | 1629 | 1533 | 143 | 40．134 | 32 |  |  |  |  |  |  | 04 | 05 |  | 52 |
| 53 | 994 | 98 | 97 |  |  |  | 93 | 925 | 9157 | 40.905 |  | 605 | 61 | 62 | 64 | 65 | 6645 | 676 | 688 | 700 | 53 |
| 54 | 767 | 75 | 74 | 7376 | 7276 |  |  | 6977 | 6877 | 41．677 |  | 2390 | 251 | 263 | 27 | 2876 | 299 | 311 | 324 | 33 | 54 |
| 55 | 5409 | 5308 | 5206 | 5105 | 5003 | 490 | 4800 | 4699 | 597 | 42.4495 | 34.8607 | 873 | 8854 | 8978 | 9102 | 9225 | 9349 | 9473 | 9596 | 972 | 55 |
| 56 | 314 | 3041 | 38 | 834 | 273 | 26 | 2524 | 20 | 2317 | $43^{\prime 2} 2$ | 35 | 5071 |  |  |  |  | 570 | 582 |  |  | 56 |
| 57 | 087 | 07 | 0669 |  |  |  |  |  | －03 | 43.9 | 36 | 14 |  |  |  |  |  |  |  | 243 | 57 |
|  | 8614 | 85 | 8400 |  |  |  |  | 64 | 7757 | 44.7650 | $36 \cdot 762$ | 775 | 788 | 801 | 81 | 8274 | 840 | 853 |  |  | 58 |
| 59 | 6348 | 6239 | 613 | 6022 | 59 |  | 56 | 558 | 5477 | $45 \cdot 5$ | 37 | 4093 | 4226 | 4358 | 449 | 4524 | 4756 | 488 | 502 | 515 | 59 |
| 60 | 4083 | 3972 | 3862 | 3751 | 3640 | 35 | 3419 | 3308 | 3197 | $46^{\prime} 3086$ | $38^{\circ} 0299$ | 0434 | 056 | 0703 | 0838 | 0973 | 1108 | 124 | 仿 | 1512 | 60 |
| 61 | 1818 | 析 | 1593 | 148 |  |  |  | 1029 | 0917 | 47.0804 | 39 | 6774 |  |  |  |  |  |  |  |  | 61 |
|  | 9552 | 9438 | 9324 | 9209 | 909 | 898 | 8866 | 8751 | 8637 | 47•85 | 39．29 | 31 |  |  |  | 3672 |  | 395 |  |  | 62 |
| 63 | 728 | 7171 | 70 | 6938 | 68 | 670 | 658 | 6473 | 635 | 48.624 | 39.931 | 945 | 95 |  |  | －02 | 016 | 030 | 044 | 058 | 63 |
| 64 | 5022 |  |  |  |  |  |  | 4195 | 4076 | $49 \cdot 395$ |  | 579 |  | d |  | 637 | 6515 | 665 |  | 694 | 64 |
| 65 | 2757 | 2 | 2517 | 2397 | 227 | 215 | 37 | 17 | 1796 | $50^{\circ} 16$ | 41 | 213 | 2283 | 242 | 25 | 27 | 286 | 3013 | 3159 | 330 | 65 |
|  | 0491 | 0370 | 0248 | 0126 | ＋00 | 9882 | 9760 | 9638 | 95 | 50．939 | 41 | 847 | 8625 | 877 | 89 | 9070 | 9219 | 9367 | 515 |  | 66 |
| 67 | 822 | 81 | 79 |  | 77 | 7608 | 7484 | 7360 | 72 | 51.711 | 42 | 4817 | 49 | 51 |  | 5420 |  | 572 |  | 60 | 67 |
|  |  |  |  |  |  |  |  | 5082 |  |  |  |  |  |  |  | 171 | 27 |  |  |  | 68 |
| 69 | 3695 | 3568 | 3441 | 3314 | 318 | 30 | 2931 | 2804 | 267 | 53254 | $43 \cdot 7343$ | 749 | 76 |  | 79 | 81 | 8274 | 8429 | 858 | 87 | 69 |
| 70 | 1430 | 1301 | 1172 | 104 | 09 | 07 | 0655 | 0526 |  | 54.026 | 44.3682 | 3839 | 3997 | 4154 | 431 | 4469 | 462 | 478 | 494 | 509 | 70 |
| 71 | 9165 | 9034 |  | 87 |  |  |  | 8247 |  |  |  |  |  |  |  |  |  |  | 295 |  | 71 |
|  | 690 | 6767 | 6634 | 6501 | 636 | 623 | 6102 | 5969 | 5836 | 55.57 | 45.63 | 6520 | 668 |  |  | 71 | 733 | 74 |  |  | 72 |
| 73 | 463 | 4500 | 436 | 4230 | 40 | 39 | 3826 | 3691 | 3556 | 56．342 | 46.269 | 2861 | 302 | 318 | 3353 | 3517 | 368 | 384 | 400 | 417 | 73 |
| 74 | ， |  |  |  | 1823 | 1686 | 1550 | 1413 | 276 | 57．1139 | 46.903 | 9201 | 936 |  | ， | 982 | do3 | 19 |  |  | 74 |
| 75 | －104 | 9965 | 27 | 9689 | 955 | 9412 | 9273 | 9135 | 899 | 57．885 | $47 \cdot 537$ | 5542 | 571 | 587 | 604 | 621 | 638 | 655 | 672 | 68 | 75 |
| 76 | 78 | 988 | 7558 | 7418 | 7278 | 7137 | 16997 | 6856 | 6716 | 58．657 | $48 \cdot 171$ | 1882 | 205 | 22 | 23 | 256 | 273 | 290 | 307 | 32 | 76 |
| 77 | 557 | 5431 | 5289 | 514 | 5005 |  | 4720 | 4578 | 4436 | 59．429 | 48.805 | 8223 | 839 |  |  | 891 | 9089 | 926 | 943 | 960 | 77 |
| 78 | 350 | 31 | 3020 | 2876 | 2732 | 2588 | 2444 | 2300 | 2156 | 60.2011 | 49.438 | 4564 | 4739 | 491 | 5090 | 5265 | 544 | 561 | 5 |  | 78 |
| 79 | 1043 | 0897 | 07 | 06 | 04 | 0314 | 0168 | －022 | 9876 | 60.9730 | 50．0726 | 0904 | 1082 | 126 | 1437 | 1615 | 179 | 197 | 214 | 23 | 79 |
| 80 | 87 | 8630 |  |  | 8187 |  |  | 77 | 7596 | 61744 | $50 \cdot 7065$ | 24 | 725 |  | 7784 | 7964 | 8144 | 832 | 8503 | 86 | 80 |
| 81 |  |  | 6213 | ${ }^{6064}$ |  |  |  | 5 | 5316 | $62 \cdot 51$ |  |  | 3767 |  |  |  |  |  |  |  |  |
| 82 | 4247 | 4096 | 3944 | 3793 | 3642 | 3490 | 3339 | 3187 | 3035 | 63.2884 | 51.9741 | 9926 | 1110 | 029 | 047 | 066 | 084 | 1032 | 121 | 140 | 82 |
| 83 | 198 | 18 | 1675 | 1522 | 析 | 1216 | 1072 | 0909 | 0755 | 64．0602 | 52.608 | 626 | 645 | 64 | 6826 | 7013 | 719 | 7386 | 757 | 775 | 83 |
| 84 | 976 | 析 | 9406 | 9251 | 90 | 89 | 8786 | 8631 | 8475 | 64.832 | 53.2418 | 2607 | 2796 | 29 | 317 | 3362 | 355 | 3740 | S92 |  |  |
| 85 | 7451 | 7294 | 7137 | 6980 | 6824 | 6667 | 6510 | 6352 | 6195 | 65 | 53.875 | 8948 | 913 | 9330 | 9521 | 971 | 99 | 109 | 028 | 047 | 85 |
| 86 | 5186 | 5027 | 4868 | 47 | 4551 | 4392 | 233 | 4074 | 3915 | 66．37 | 54.5095 | 5288 | 548 | 5675 | 5868 | 6062 | 625 | 6448 | 664 | 683 | 86 |
| 87 | 2920 | 2760 | 2599 | 2439 | 2278 | 2118 | 1937 | 1796 | 1635 | 67．1474 | 55.1433 | 1629 | 1824 | 20 | 2216 | 2411 | 260 | 2802 | 299 | 319 | 87 |
| 88 | 065 | 0493 | 0330 | 0168 | －006 | 9843 | 9680 | 9518 | 9355 | $67 \cdot 9192$ | 55．7771 | 7969 | 8167 | 836 | 8563 | 8761 | 8958 | 9156 | 935 | 955 | 88 |
| 89 | 839 | 82 | 8061 | 78 | 7733 | 7569 | 7404 | 7240 | 7075 | 68.6911 | 56.4110 | 4310 | 4510 | 471 | 4910 | 511 | 5310 | 5510 | 571 | 59 | 89 |
| 90 | 6124 | 5958 | 5082 |  | 533 | 5294 | 5128 | 4961 | 4795 | 69.4629 | 57．0448 | 0650 | 0853 | 105 | 1257 | 146 | 5 | 510 | 206 | 22 | 90 |
|  | 159 | 3691 | 3523 |  |  | 3019 | 2851 | 2683 | 2515 | 70．234 | 57．6786 | 6991 | 7196 | 74 | 76 | 78 | 80 | 8218 | 423 |  |  |
| 92 | 1594 | 1424 | 1254 | 108 | 0915 | 07 | 0575 | 0405 | 0235 | 71.006 | 58．3125 | 3331 | 3538 | 37 | 39 | 4150 | 4366 | 4572 | 477 | 498 | 92 |
| 93 | 9329 | 9157 | 8986 | 8814 | 8642 | 8470 | 8299 | 8127 | 7955 | 717783 | 58.9463 | 9672 | 9881 | ＋ | 0299 | 0508 | 0717 | 0926 | 13 | 134 | 93 |
| 94 | 7063 | 6820 | 6717 | 6543 | 637 | 6196 | 6022 | 5849 | 5675 | 72．5501 | 59.5801 | 6013 | 6224 | 643 | 664 | 6858 | 7069 | 7280 | 749 | 770 | 94 |
| 95 | 4798 | 4623 | 44 | 4272 | 40 | 21 | 3746 | 3570 | 3395 | 73.3219 | 60.213 | 2353 | 2567 | 2780 | 299 | 3208 | 342 | 363 | 38 | 406 | 95 |
| 96 | 2533 | ， | 2179 | 201 | 1824 | 647 | 1470 | 1292 | 115 | 74 | 60：847 | 8594 | 8510 | 912 | 析 | 9557 | 9773 | 998 | －204 | 042 | 96 |
| 97 | 0267 | －089 | 764 | 9731 | 9552 | 9372 | 91917 | 90 | 8835 | $74 \cdot 8655$ | 61.4816 | 5034 | 5252 | 547 | 5689 | 5907 | 6125 | 6362 | 6560 | 671 | 97 |
| 98 | 807 | 7821 | 7641 | 74 | 727 | 7098 | 6917 | 6736 | 6555 | 75.6373 | 62.1154 | 1375 | 1595 | 1816 | 2036 | 2256 | 2476 | 2697 | 2917 | 313 | 98 |
|  | 37 | 5554 | 5372 | 2180 | 500 | 4823 | 4641 | 4458 | 4275 | $76 \cdot 4092$ | $62 \cdot 7493$ | 7715 | 7938 | 8161 | 8383 | 8606 | 8828 | 9051 | 9273 | 495 | 99 |
| 100 | 3472 | 3287 | 3103 | 2918 | 2734 | 2549 | 2364 | 2179 | 1995 | $77 \cdot 1810$ | 63：3831 | 4056 | 4281 | 4506 | 4731 | 4955 | 5180 | 5405 | 5629 | 5854 | 100 |
|  | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | 37 | $36^{\prime}$ | $35^{\prime}$ | 34 | 33 | $32^{\prime}$ | 31 | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | $37^{\prime}$ | 36 | $35^{\prime}$ | 34 | ， | $32^{\prime}$ | $31^{\circ}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 39＊ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $39^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 30 | $31^{\prime}$ | 32＇ | $33^{\prime}$ | $34^{\prime}$ | $35^{\prime}$ | $36^{\prime}$ | 37＇ | 38＇ | 39＇ | $30^{\prime}$ | $31^{\prime}$ | 32＇ | $33^{\prime}$ | $34^{\prime}$ | 35 | $36^{\prime}$ | $37^{\prime}$ | $38^{\prime}$ | $39^{7}$ |  |
|  | 7716 | 7714 | 7713 | 771 | 7709 | 7707 | 7705 | 7703 | 770 | 77 | 36 | 6363 | 65 | 6368 | 6370 | 6372 | 6374 | 6376 | 6379 | 6381 |  |
| 2 | 5432 | 5429 | 5425 | 5421 | 5418 | 5414 | 5410 | 5407 | 5403 | －539 | －2722 | 2726 | 2731 | 2735 | 27 | 27 | 2748 | 2753 | 2757 | 2762 |  |
| 3 | 3149 | 3143 | 3138 | 3132 | 3127 | 3121 | 3115 | 3110 | 3104 | 2．3099 | －9082 | 9089 | 9096 | 9103 | 9109 | 9116 | 9123 | 9129 | 9136 | 91 |  |
| 4 | 0865 | 0858 | 0850 | 0843 | 835 | 0828 | 0821 | 0813 | 0806 | 3.079 | 5 | 5452 | 5461 | 547 | 547 | 5488 | 549 | 5506 | 5515 | 5524 |  |
| 5 | 8581 | 8572 | 8563 | 8553 | 8544 | 8535 | 8526 | 8516 | 8507 | 3.8498 | $3 \cdot 1804$ | 1815 | 1826 | 1838 | 1849 | 1860 | 1871 | 1882 | 1894 | 1905 |  |
| 6 | 629 | 6286 | 62 | 62 | 6253 | 62 | 6231 | 6220 | 6209 | 4.61 | 3.8165 | 8178 | 8192 | 8205 | 8219 | 8232 | 8245 | 8259 | 8272 | 8286 |  |
| 7 | 4014 | 4001 | 888 | 3975 | 962 | 39 | 3936 |  | 3910 | 5.3897 | 525 | 4541 | 45 | 4573 | 4588 | 46 | 46 | 4635 | 46 | 4667 |  |
| 8 | 173 | 1715 | 1700 | 1686 | 1671 | 165 | 1641 | 1626 | 161 | ．1597 | 5.0886 | 0904 | 09 | 0940 | 0958 | 097 | 095 | 1012 | 1030 | 04 |  |
|  | 94 | 9430 | 9413 | 9396 | 9380 | 9363 | 346 | 9330 | 9313 | 6.929 | $5 \cdot 72$ | 7267 | 7287 | 7308 | 7328 | 7348 | 析 | 7388 | 7408 | 7429 |  |
| 10 | 716 | 7144 | 7125 | 07 | 7088 | 7070 | 7051 | 7033 | 014 | $7 \cdot 6996$ | 6．3608 | 3630 | 3653 | 3675 | 3698 | 372 | 3742 | 3765 | 3787 | 3810 | 10 |
| 11 | 487 | 4858 | 4838 | 4818 | 4797 | 47 | 47 | 4736 | 4716 | 8．4695 | 6.996 | 9993 | ．018 | 0043 | 0067 | 00 | 01 | 01 | 0166 | 0191 | 11 |
| 12 | 259 | 257 | 25s | 252 | 2506 | 24 | 246 | 2439 | 24 | 9．239 | ． 6329 | 6356 | 6383 | 641 | 64 | 64 | 649 | 65 | 6545 | 6572 | 12 |
| 13 | 031 | 02 | 0263 | 023 | 0215 | 01 | 016 | 0143 | 0118 | 10．009 | 8.2690 | 27 | 27 | 277 | 2807 | 2836 | 2865 | 2894 |  | 2952 | 13 |
| 14 | 8027 | 8002 | 7976 | 79 | 7924 | 7898 | 787 | 7846 | 7820 | $10 \cdot 77$ | 8.9051 | 9082 | 91 | 914 | 917 | 92 | 923 | 9271 | 9302 | 9333 | 4 |
| 15 | 574 | 57 | 56 |  | 5633 |  |  |  | 552 | 11.5494 | 9．5412 | 5445 | 5479 | 5513 | 55 | 55 | 5614 | 5647 | 5681 | 5714 | 15 |
| 16 | 3460 | 3430 | 3401 | 3371 | 334！ | 3312 | 3282 | 3252 | 3223 | 12.3193 | 10.1773 | 1808 |  | 1880 |  | 1952 | 1988 | 2024 | 2060 |  | 16 |
| 17 | 117 | 1145 | 1113 | 1082 | 1050 | 10 | 098 | 0956 | 09 | 13.08 | 10.81 | 81 | 8210 | 8248 | 8286 | 8324 | 8362 | 8400 | 8438 |  |  |
| 18 | 889 | 88 | 8826 | 8792 | 8759 | 87 | 8692 |  | 8626 | 13 | 11 | 4534 | 4575 | 461 | 4656 | 468 | 4736 | 4777 | 48 | 485 | 18 |
| 18 | 660 | 6574 | 6538 | 6503 | 646 | 643 | 639 | 6362 | 6327 | 14.629 |  | 0897 | 0940 | 0983 | 1025 | 106 | 1111 | 153 | 1196 | 1238 |  |
| 20 | 4325 | 4288 | 4251 | 4214 | 4177 | 4140 | 4103 | 066 | 4028 | 15．399 | $12 \cdot 7216$ | 7261 | 7305 | 7350 | 7395 | 744 | 7485 | 7530 | 757 | 7619 | 0 |
| 21 | 204 | 20 | 196 | 192 | 188 | 184 | 1808 | 1769 | 1730 | 16 | 13 | 36 | 3671 | 3718 | 3765 | 3812 | 38 | 3906 | 3953 | 4000 | 21 |
| 22 | 97 |  |  | 9635 | 9594 | 95 | 9513 | 9472 | 9431 | 16.93 | $13 \cdot 9937$ | 9987 | －036 | 0085 | 01 | 01 | 0233 | 0283 | 0332 | 38 | 2 |
| 23 | 747 | 7431 | 738 | 73 | 73 | 726 | 7218 | 7175 | 7133 | $17 \cdot 70$ | 14－6298 | 635 | 6401 | 645 | 650 | 65 | 6608 | 6659 | 671 | 676 | 23 |
| 24 | 519 | 51 | 5101 | 5057 | 5012 | 49 | 492 | 4879 | 4834 | 18.47 | 15.265 | 2713 | 2766 | 282 | 287 | 29 | 29 | 3036 | 308 | 314 | 24 |
| 25 | 29 |  | 2814 |  |  | 2575 |  |  |  | 19.2489 |  | 76 | 132 | 9188 |  | 9300 | 356 | 412 | 9468 | 9524 | 25 |
| 26 | 062 | 0574 |  |  | 0430 | 0382 | 0333 | 0285 | 0237 | 20.0189 | $16 \cdot 5380$ | 5439 | 5497 | 5555 | 5614 | 567 | 5730 |  |  |  | 26 |
| 27 | 833 | 8289 | 823 | 8189 | 81 | 80 | 8039 |  | 7938 |  |  |  | 1862 | 19 |  | 20 | 2104 | 5 | 2225 | 228 | 27 |
| 28 | 605 |  | 59 |  | 58 | 579 |  |  | 56 | 21.55 | $17 \cdot 810$ | 8165 | 8228 | 8290 | 835 | 84 | 8479 | 8541 | 86 |  | 28 |
| 29 | 377 |  | 664 | 3610 | 355 |  |  |  | 33 | 22 | $18^{\circ} 44$ | 452 | 45 | 465 | 47 | 4788 | 4853 | 4918 | 4983 |  | 29 |
| 30 | 1487 | 1432 | 76 | 321 | 1265 | 121 | 115 | 1098 | 1043 | 23.0 | 19.0823 | 089 | 095 | 102 | 109 | 1160 | 1227 | 129 | 136 | 1429 | 30 |
| 31 | 920 | 914 | 9089 | 9031 | 8974 | 8917 | 8859 | 8802 | 8744 | 23•8687 | 19.7184 | 7254 | 732 | 739 | 7462 | 7532 | 7601 | 7671 | 7740 | 7810 | 31 |
| 32 |  |  | 6801 | 6742 | 668 |  |  | 6505 | 446 | 24 | 20．3545 | 3617 | 36 | 376 | 38 | 3904 | 3976 | 04 | 119 | 4191 | 32 |
| 33 | 463 | 457 | 4514 | 44 | 439 | 433 | 42 | 420 | 4147 | $25 \cdot 40$ | 20. | 99 | －05 | 012 | 02 | 02 | 0350 | 042 | 049 | 057 | 33 |
| 34 | 23 | 22 | 22 | 216 | 21 | 2038 |  | 1911 | 1848 | $26 \cdot 17$ | $21 \cdot 6$ | 63 | 641 | 6495 | 65 | 66 | 672 | 680 | 687 | 695 | 34 |
| 35 | 006 | －004 |  |  |  |  |  | 9615 | 9550 | 26.9485 | 22 |  |  | 2863 |  |  | 3098 | 3177 | 3255 | 333 | 35 |
| 36 | 778 | 7718 | 7652 | 7585 |  |  |  | 7318 | 7251 | 27.718 | 22 | 9069 | 9150 | 9230 | 9311 | 939 | 473 |  |  |  | 36 |
| 37 | 550 | 54 | 53 | 5296 | 5227 | 515 |  |  | 4953 |  | 23 | 32 | 55 |  |  |  |  | 5930 | 6013 | 609 | 37 |
| 38 | 3217 | 31 | 307 | 300 | 29 | 2865 | 2795 | 2725 | 2654 | 29.258 | 24. | 179 | 18 | 196 | 20 | 21 | 21 | 2306 | 239 | 2477 | 38 |
| 39 | 0934 | 0861 | 078 |  | 0645 | 057 | 050 | 0428 | 0355 | 30 | 24.80 | 8158 | 8246 | 8333 | 842 | 8508 | 8595 | 8683 | 877 | 8857 | 39 |
| 40 | 8650 | 8576 | 8502 | 8428 | 83 | 827 | 8205 | 8131 | 8057 | 130．7983 | 25．4431 | 4521 | 4611 | 4701 | 4790 | 488 | 4970 | 505 | 514 | 523 | 40 |
| 41 | 6366 | 6290 | 6214 | 6138 | 6062 | 5986 | 5910 | 5834 | 5758 | 31 | 26.0792 | 0884 | 0976 | 1068 | 1160 | 1252 | 1344 | 1436 | 1528 | 161 | 41 |
| 42 | 40 | 4005 | 3927 | 3849 | 37 | 369 | 3616 | 538 | 3460 | 32 | 26 | 7247 | 73 | 7436 | 7530 |  |  | 781 | 7906 |  | 42 |
| 43 | 179 | 1719 | 16 | 156 | 14 | 140 | 1321 | 241 | 1161 | 33 | 27 | 36 | 370 | 3803 | 39 | 3996 | 4092 | 418 | 4285 | 438 | 43 |
| 44 | 95 | 943 | 9352 | 92 | 9189 | 9107 | 26 | 44 | 8863 | 33．8781 | 27.98 | 99 | －07 | 01 |  | 03 | 046 | 0565 | 066 | 076 | 44 |
| 45 | 7231 | 7148 | 7064 | 698 | 6898 | 681 | 6731 | 6648 | 6564 | 34 | 28.6 | 6336 | 6437 | 6538 |  |  | 6841 | 6942 | 7042 |  | 45 |
| 46 | 494 | 4862 | 4777 |  | 460 |  | 4436 | 4351 | 4265 | 35 | 29 | 26 | 28 | 29 | 300 | 3112 | 32 | 3318 |  |  | 46 |
| 47 | 266 | 257 |  |  | 231 |  | 2141 |  |  |  |  | 906 | 91 | 927 |  |  |  |  |  |  | 47 |
| 48 | 0380 | 029 | 0202 | 0113 | ＋02 |  | 9846 | 57 | 966 | 36 | 30.5318 | 542 | 55 | 5641 | 57 | 5856 | 963 | 6071 | 6179 | 628 | 48 |
| 49 | 8096 | 8005 | 791 | 782 | 77 |  |  |  | 737 | 37 | 31 | 17 |  |  | 21 | 2228 | 33 | 2468 | 2557 | 266 | 49 |
| 50 | 5812 | 5720 | 5627 | 5535 | 5442 | 5349 | 527 | 64 | 5071 | $38^{\circ} 497$ | $31 \cdot 8039$ | 8151 | 826 | 837 | 84 | 86 | 8712 | 3824 | 8936 | 02 | 5 |
| 51 | 3529 | 3434 | 3340 | 3245 | 3151 | 305 | 2962 |  | 2773 | 39 | $32 \cdot 4400$ | 4514 |  |  |  |  |  | 5201 |  |  | 51 |
| 52 | 12 |  | 1052 | 095 | 086 | 07 | 0667 | 0570 | 047 | 40.037 | 33.0 | 08 | 099 |  |  | 1344 | 146 | 577 | 1693 | 1810 | 52 |
| 53 | 8961 | 8863 | 876 | 86 | 85 | 847 | 8372 | 8274 | 817 |  | $33 \cdot 7$ |  |  |  |  |  |  |  |  | 819 | 53 |
| 54 | 6677 | 6577 | 64 | 637 | 627 | 6177 | 6077 | 77 | 5877 | 41.57 | 34•3482 | 36 | 372 | 846 | 39 | 4088 | 20 | 633 | 4451 | 457 | 54 |
| 55 | 43 | 4292 | 4190 | 40 | 398 | 388 | 3782 | 80 | 3578 | 42.347 | 4984 |  | ＋09 | 0213 | 0337 | 4 6 | 0583 | 0706 | 0830 | 095 | 55 |
| 56 | 2110 | 2006 |  | 17 | 169 | ， |  |  | 1280 |  | $35 \% 6204$ | 632 | 645 | 65 |  |  |  | 7083 | 20 |  | 56 |
| 57 | 982 | 972 | 96 |  | 940 | 92 |  |  | 8981 | 43 | 36.2565 | 2692 | 2820 | 2948 |  |  |  | 3459 |  |  | 57 |
| 58 | 75 | 743 |  | 7220 | 7113 | 7005 | 6898 | 790 | 6683 | 44．657 | 36. | 9056 | 9186 | 9316 | 9446 | 957 | 970 | 83 |  |  | 58 |
| 59 | 5259 | 5149 | 504 |  | 48 |  |  |  | 43 | $45^{4} 427$ |  |  |  |  |  |  |  | 帾 | 63 | 647 | 59 |
| 60 | 2975 | 2864 | 2753 | 2642 | 253 | 24 | 2308 | 219 | 2085 | 46．1974 | $38 \cdot 1647$ | 1782 | 1916 | 2051 | 218 | 2320 | 245 | 258 | 2723 | 285 | 60 |
| 61 | 069 |  | 046 |  |  |  |  |  |  | 46 | 800 |  |  |  |  |  |  |  |  |  | 61 |
|  | 840 |  |  | 80 | 7948 |  | 7718 | 603 | 7488 | $47 \cdot 737$ | 39.436 | 4508 | 4647 | 4786 | 4925 | 506 | 520 | 5342 | 548 |  | 62 |
| 63 | 6123 | 6007 | 5890 | 57 |  |  | 5423 | 迷 | 5190 | 48.5073 | 40．07 | 08 | 10 |  |  |  |  | 1348 |  |  | 63 |
| 64 | 384 | 37 |  |  |  |  |  | 10 | ， | 49.277 | $40 \cdot 70$ | 239 | 7377 | 75 | 268 | 7808 | 795 | 2091 |  |  | 64 |
| 65 | 155 | 36 | 1315 | 119 | 107 | 0954 | 0834 | 0713 | 059 | 50.0472 | 41.34 | 359 | 374 | 3888 | 403 | 418 | 432 | 447 | 4617 | 476 | 65 |
|  | 92 | 9150 | 9028 | 890 | 878 |  | 8539 | 416 | 8294 | 50．817 | 41.981 | 996 | ＋10 | 0256 | 0404 | 055 | ，700 | 0848 |  |  | 6 |
| 67 | 698 | 68 | 67 | 66 | 64 |  |  |  | 599 | 51.587 |  |  |  |  |  |  | 7074 | 722 |  |  | 67 |
| 68 | 470 | 457 | 44 | 432 |  | 40 | 3949 | 3823 | 369 | 52.357 | 43.25 | 26 | 28 |  |  | 329 | 344 | 360 | 37 |  | 68 |
| 69 | 2421 | 229 | 2166 | 20 | 19 |  | 1654 | 1526 | 398 | 53.1270 | $43 \cdot 889$ | 9049 | 92 | 935 | 9513 | 9668 | 982 | 997 | $\bullet 13$ | 02 | 69 |
| 70 | 0137 |  |  |  | 96 |  | 9359 |  |  | 53.897 | $44 \cdot 5255$ | 5175 |  |  | 588 |  | 19 | 6354 |  |  | 70 |
| 71 | 785 | 7722 | 7591 | 745 |  |  |  |  | 6801 | 54.66 | 45.161 | 1775 |  |  |  |  |  |  |  |  |  |
|  | 5570 | 5436 | 5303 | 5170 | 503 | 4903 | 477 | 4636 | 4502 | 55.4369 | $45 \cdot 797$ | 8138 | 829 | 846 | 8622 | 8784 | 8945 | 9107 | 926 | 942 | 72 |
| 73 | 3286 | 3151 | 3016 |  |  | 2610 | 素 | 339 | 2204 | 56.20 | 46.433 | 4501 | 4665 | 4828 | 4932 | 5156 | 5320 | 5483 | 564 | 咗 | 73 |
|  | 1002 | 08 | 0728 | 059 | 0454 | 0317 | 0180 | －043 | 9905 | 56.9768 | 47．0698 | 0864 | 1030 | 1196 | 1362 | 1528 | 1694 | 1860 | 202 |  |  |
| 75 | 8718 | 8580 | 8441 | 8302 | 8163 | 8024 | 7885 | 7746 | 7607 | 57.76 | $47 \cdot 705$ | 72 | 7395 | 7563 | 7732 | 7900 | 8068 | 2 | 840 | 857 | 75 |
| 76 | 6435 | 6294 | 6153 | 6013 | 5872 | 5731 | 90 | 5449 | 5308 | 58.5167 | 48.3419 | 3590 | 3761 | 393 | 4101 | 4272 | 4442 | 4613 | 478 | 495 | 7 |
| 77 | 4151 |  | 3866 | \％ 12 |  |  | 290 | 3152 | 2010 | 59.28 | 48.97 | 9953 | －12 | 26 | 241 | 6 | 寿 | 988 | 162 |  | 77 |
| 78 | 1867 | 1723 | 1578 | 1434 | 1290 | 1145 | 1000 | 0856 | 0711 | 60.056 | $49 \cdot 6141$ | 6316 | 6491 | 6666 | 6841 | 701 | 7191 | 7366 | 754 | 77 | 78 |
| 79 | 9583 | 9437 | 700 | ¢855 | 8707 | 8852 | 8705 | 8559 | 8412 | $60 \cdot 826$ | 50．2502 | 2679 | 2856 | 303 | 221 | 析 | 3565 | 374 | 391 | 409 | 79 |
| 80 | 7300 | 7152 | 7004 | 6855 | 6707 | 6559 | 6411 | 6262 | 6114 | 61＇596 | $50 \cdot 8863$ | 9042 | 922 | 940 | 958 | 976 | 9939 | 11 | 29 | 20， | 88 |
|  | 5016 |  |  | 456 | 44 | 4266 | 4116 | 3966 | 3815 | 62＇36 | 51．522 | 5405 | 55 | 57 | 5950 | 258 | 析 | 649 |  |  | 81 |
| 82 | 2732 | 2580 | 2429 | 227 | 21 | 1973 | 1821 | 1669 | 1517 | $63 \cdot 136$ | 52．158 | 176 | 19 | 213 | 232 | 250 | 2688 | 2871 | 3055 | 32 | ， |
| 83 | 0448 | 0295 | 184 | 988 | 矿 | 968 | 9526 | 9372 | 9218 | 63＇9064 | 52＇79 | 8131 | 8317 | 8504 | 869 | 8876 | 析 | 9248 | 943 |  | 83 |
| 84 | 8165 | 8009 | 7854 | 769 | 754 | 738 | 7231 | 7075 | 6920 | 64．6764 | 53.430 | 4494 | 4683 | 487 | 506 | 5248 | 5436 | 5624 | 5813 | 600 | 84 |
| 85 | 588 | 5724 | 5566 | 5409 | 5251 | 5094 | 4936 | 79 | 462 | $65 \cdot 4463$ | 54.066 | 0857 | 10 | 123 | 1429 | 1620 | 1810 | 2001 | 219 | 238 | 05 |
| 86 | 359 | 3438 | 3279 | 310 |  | 25 | 析 | 2482 | 232 | 66.21 | 54.70 | 7220 | 74 | 76 | 7799 | 799 | 8185 | 8377 | 8570 | 87 | 86 |
|  | 1313 | W52 |  | 83 | 063 | 0508 | 0346 | 0185 | ＋024 | 66.9862 | 55.3381 | 358 | 3778 | 397 | 4 | 4364 | 4559 | 4754 | 4949 | 5152 | 87 |
| 88 | 9030 | 8867 | 870 | 85 | 837 | 8215 | 8052 | 7888 | 7725 | 677562 | 55.974 | 994 | －144 | 03 | 05 | 0736 | 0933 | 1130 | 1327 | 152 | 88 |
| 89 | 6746 | 6581 | 641 | 6252 | 6787 | 592 | 5757 | 5592 | 5427 | $68^{\circ} 5261$ | 56.6110 | 6309 | 6509 | 6709 | 6998 | 188 | 7307 | 7507 | 7706 | 90 | 89 |
| 90 | 4462 | 4296 | 4129 | 3962 | 3796 | 3629 | 3462 | 3295 | 3128 | 69．2961 | $57 \cdot 2470$ | 2672 | 2874 | 3076 | 3278 | 348 | 3682 | 3883 | 4085 | 428 | 90 |
| 91 | 217 | 2010 | 18 | 167 | 15 | 1336 | 167 | 0998 | 0829 | 70．066 | 57.8831 | 9035 | 924 | 9444 | 9648 | 985 | ＋056 | 0260 | 046 |  |  |
| 92 | 989 | 972 | 95 | 938 | 9213 | 9043 | 8872 | 8702 | 8531 | 70.836 | 58．5192 | 5398 | 5605 | 5811 | 6018 | 622 | 6430 | 663 | 684 | 704 | 92 |
|  | 7611 | 743 | 7267 | 7094 | 2931 | 6750 | 6577 | 6405 | 6232 | 71.6060 | $59 \cdot 1553$ | 1761 | 1970 | 2179 | 2387 | 29 | 280 | 3013 | 3221 | 3421 | 93 |
| 94 | 5327 | 515 | 4979 | 4805 | 4631 | 4457 | 4282 | 4108 | 3934 | 72.3759 | 59.7914 | 8124 | 8335 | 8546 | 8757 | 896 | 9179 | 9389 | 9600 | 981 | 94 |
| 95 | 3043 | 2868 | 2692 |  |  | 2164 | 1988 | 1811 | 1635 | 45 | 60.4274 | 4487 | 470 | 4914 | 5127 | 5340 | 5553 | 5766 | 5978 | 6191 | 95 |
| 96 | 076 | 058 | 404 | 793 | 7757 | 7877 | 7393 | 7215 | 7337 |  | 61 | 0850 | 1066 | 1281 | 707 | 1712 | 1927 | 142 |  |  |  |
| 97 | 847 | 82 | 811 | 793 | 7757 | 7578 | 73 | 7218 | 7038 | 74.685 | 61.699 | 7214 | 7431 | 764 | 78 | 8084 | 8301 | 8519 | 873 | d5 | 97 |
| 98 | 619 | 6011 | 582 | 56 | 5466 | 55 | 5103 | 4921 | 4739 | 75.455 | 62 335 | 3577 | 3796 | 4016 | 4236 | 445 | 4676 | 4895 | 511 | 533 | 98 |
|  | 1625 | 1420 | 125 |  | 3175 | 06 | 2808 | 2625 | 2441 | 76．925 | 62.9717 | 9440 | 162 | 675 | 6976 | 2008 | 1050 | 27 | 7872 | 㖪 | O |
|  | 1625 | 1440 | 1254 | 1069 | 0884 | 0699 | 0513 | 0328 | ＋142 | $76 \cdot 995$ | 63.6078 | 6303 | 6527 | 675 | 6976 | 7200 | 7424 | 7648 | 7872 | 3096 | 100 |
|  | 30 | $29^{\prime}$ | $28^{\prime}$ | $27^{\prime}$ | $26^{\prime}$ | 25 | 24 | $23^{\prime}$ | 22 | 21 | 30 | $29^{\prime}$ | 28 | 27 | $26^{\prime}$ | $25^{\prime}$ | 24 | $23^{\circ}$ |  | $21^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $0^{\circ}$ |

TRAVERSE TABLES.


TRAVERSE TABLES.


TRAVERSE TABLES.

| Cosin |  |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | \%60 | ${ }_{1859}^{7659}$ |  |  | ${ }^{7535}$ |  | ${ }^{7649}$ | ${ }_{5}^{764}$ |  |  |  |  |  |  | ${ }^{6437}$ |  |  |  |  |  |  |
|  |  | 2976 | 2930 | 2364 | ${ }^{2359}$ |  | 229 | 2942 |  |  | 12356 |  | 2897 | 2894 | ${ }_{9310}^{2874}$ |  | 4 | 9330 |  |  |  |
|  |  | ${ }^{0634}$ | 0627 |  | ${ }_{8265}^{0612}$ |  | 824 | ${ }^{83}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 6598 | 5951 | 5940 | 5929 | 5918 | 5907 | 5895 | ${ }^{5884}$ | 5873 | 4:58 | 3.8567 | 8581 | 8594 | 8607 | 8621 | 8634 | 8647 | ${ }^{8661}$ | 8874 |  |  |
|  |  | 3610 | 3597 | 3584 |  |  | 354 |  |  |  |  |  |  | 5042 |  |  |  | 5104 | 5120 |  |  |
|  |  |  | ${ }_{89} 895$ | ${ }_{8893}{ }^{239}$ |  | ${ }_{880} 8$ |  |  |  |  |  |  | 1459 | 1476 |  | 1512 | $\begin{aligned} & 1530 \\ & 7971 \end{aligned}$ | 1548 | 1565 3011 |  |  |
|  | 6604 |  |  |  |  |  |  | 473 |  | ${ }_{7} 6436$ | 6 6,4 |  | ${ }_{4} 33$ |  | 368 | 4390 | 4412 | 4335 | ${ }_{4657}$ |  |  |
|  | ${ }^{4265}$ | 424 | 422 |  | ${ }^{183}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 12 \\ & 13 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 7148 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2407 | 488 |  |  |  | \%76 | 4738 | 4710 | 4682 |  |  |  | 6485 |  |  |  |  | ${ }^{625}$ | 668 |  |  |
| 16 |  |  |  |  |  |  |  |  |  |  | 10.284 |  |  |  |  |  |  |  |  |  |  |
| $17$ |  | $01$ | $0$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 7618 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 117 | 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 889 | 083 |  |  |  |  |  |  |  |  |  | 5032 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 3671 | 3626 | 35 | 353 |  |  |  | ${ }^{4322}$ | 4376 | 29 |  | 4536 | 4590 |  |  |  |  |
|  |  |  | 1418 |  |  |  |  | 1184 | 1137 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{9123} 6$ | 673 |  | 6830 |  |  |  |  |  |  |  | ${ }_{3621}^{724}$ | 7293 |  | 7414 | ${ }^{7472}$ | 7330 | 7588 |  |  |
| ${ }_{28}^{28}$ | 4492 | 44 | ${ }_{4388}$ | 4335 | ${ }_{4283}$ | 4230 | 4178 | 4126 | 4073 |  |  | . 063 | 0105 | ${ }^{2168}$ | 3230 | 2892 | 0355 | 041 | 047 |  |  |
|  |  |  |  |  |  |  | 1827 |  | 1718 |  |  |  | 6538 |  |  |  |  |  |  |  |  |
|  | 774 | 741 | 23 | 7300 | ${ }^{7242}$ |  | 7126 |  | 700 |  |  | 1333 | 9402 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 116 | 805 | 798 |  | 7854 | 7788 | 772 |  | 7591 |  |  | 5054 | ${ }_{5132}$ | 5210 | 5287 |  | 543 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | ${ }^{3} 1404$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{8326}$ |  |  |  |  |
|  |  |  | 861 |  |  |  |  |  | ${ }^{1}$ |  |  |  | ${ }^{2489}$ |  |  |  |  |  |  |  |  |
| 40 | 6418 | ${ }^{634}$ |  | 6193 | 6118 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9092 | 182 | 27 |  |  |
| 4 |  |  |  |  |  | 136 |  | 18 | 17 |  |  | .06 |  |  |  |  |  |  |  |  |  |
|  | 7390 |  | ${ }^{2} 8$ |  | 673 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 46 | 238 | 22 | 220 | 2122 | 2036 | 1950 | 1864 | 1778 | 168 |  | 29. | 5785 | 5887 | 599 | 6092 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 |  | 2929 | 283 |  |  |  |  |  | 2273 |  |  | 1505 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 7935 |  |  |  |  |  |  |  |  |  |
| ¢ 5 |  | 59 |  | 57 | 5607 | 550 | 540 | 530 | 521 |  |  | 0796 | 0914 | 1032 | 1150 | 1268 | 1386 | 1503 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  | ${ }^{088}$ |  |  |  |  |  |  |  |  |  |
| 58 | ${ }^{6}$ | 119 | 408 | ${ }_{398}^{638}$ | 387 | ${ }_{3763}^{672}$ | ${ }_{365}^{600}$ | ${ }_{354}^{589}$ | 3437 | ${ }_{4}^{43}$ |  | ${ }_{294}^{651}$ | ${ }^{6043}$ | ${ }^{6770}$ | ${ }_{3}^{6834}$ |  |  |  |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 45.86 | 3'567 | 88 |  |  |  |  |  |  |  |  |  |
|  | 72 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 2608 | 24 |  | 22 | 213 | 201 | 19 | 1782 | 1664 |  |  |  | 5237 |  |  |  | 5798 |  |  |  |  |
|  |  |  | ${ }_{7} 188$ |  |  | ${ }_{721}^{9670}$ | 719 | 707 |  |  |  |  |  |  |  |  | ${ }_{868}^{223}$ |  |  |  |  |
|  | 558 | $\begin{aligned} & 5424 \\ & 3 \end{aligned}$ |  |  |  |  | 4888 | 473 |  |  |  | ${ }^{4387}$ |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 2778 |  |  |  | 224 |  |  |  |  |  |  |  |  |  |  |  |  |
| 69 |  | 078 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 70 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 77 | ${ }^{389}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 1952 | ${ }_{907}^{197}$ |  | ${ }_{880} 14$ | 866 |  | 8393 | 825 | 8119 |  |  | 9398 | 9560 | ${ }^{3288} 9$ | ${ }^{3888}$ | ${ }_{8048}^{3509}$ | 021 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\frac{75}{76}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 20 |  |  |  |  | ${ }^{3} 889$ | A84 | 1055 |  |  |  |  |  |  |  |  |  |  |  |  |
| 78 | 751 | 736 | 72 | 707 | 693 | 6785 | 6639 | 6493 | 6346 |  |  | ${ }_{1548}$ | 1722 | 1896 | 2069 | ${ }^{2823}$ | 241 |  |  |  |  |
|  |  |  |  | 4332 |  |  | ${ }^{42888}$ | ${ }_{4}^{1780}$ | 1637 |  |  | 7978 | 459 | 47 | ${ }^{3506}$ | 8882 | 8858 | ${ }^{9033}$ |  |  |  |
|  | 0496 | 034 |  | 04 | 9890 |  |  | 963 | 9283 | 61.913 |  | 0838 |  | 1199 | 1380 |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{84}^{83}$ |  |  |  | 300 |  | 269 | 2534 | 237 | 221 |  |  |  | 031 | 503 | 069 |  | 208 |  |  |  |  |
|  | 1138 | 0979 | 0820 | 0661 |  | 0342 |  | ${ }^{2} 024$ | 9865 | 64.970 | 54.63 | 1659 | 6788 | 6938 | 7127 | 731 |  | 769 | 188 |  |  |
|  | 878 |  |  |  | 8155 |  |  |  |  |  |  |  |  |  | ${ }^{356}$ |  |  |  |  |  |  |
|  | 511 | ${ }^{62}$ |  | 362 | 3460 | ${ }_{329}^{504}$ | ${ }_{3}^{543}$ | 296 | 2801 |  |  |  | 9613 | ${ }_{624}^{988}$ | 8000 | ${ }^{6633}$ |  |  |  |  |  |
| 88 |  | \% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 45 | 441 | 42 |  |  | ${ }^{372}$ | 355 | 338 |  |  |  |  |  | 2184 |  |  |  |  |  |  |
|  |  | 224 | 2073 |  |  |  | 1377 |  |  |  |  |  |  | 341 |  |  |  |  |  |  |  |
| ${ }_{95}^{94}$ | ${ }^{174}$ | ${ }_{756} 9$ | 738 | ${ }_{725} 29$ | 0311 |  | 667 | 6497 | 631 | 72.614 | 61.06 | 0860 | 1072 | 1283 | 1495 |  | 91 |  |  |  |  |
|  |  | 52 | 504 |  |  |  | 332 | 1145 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | ${ }^{962}$ | ${ }^{2938}$ |  |  |  |  |  | 0587 |  |  | 288 |  |  |  |  |
|  |  | 857 |  |  |  |  | 12721 | 1738 |  | ${ }_{76} 76.4359$ |  |  | ${ }^{233}$ |  | 2679 | 2902 | 124 |  |  |  |  |
|  | - | 159 |  |  | ${ }^{56}$ ] | ${ }^{555^{\prime}}$ | 54 | ${ }^{53}$ | $5{ }^{2}$ | $51^{1}$ |  |  |  |  |  | 65' |  |  |  | ${ }^{2}$ |  |
|  |  |  |  |  | Sine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 40 | Coslive． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $40^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11{ }^{\prime}$ | $12^{\prime}$ | 13 | （0s | ， | $16^{\prime}$ | 17 |  | 19 | $10^{\prime}$ | $1{ }^{\prime}$ |  | 13 | $14^{\prime}$ |  |  |  |  |  |  |
|  | 7642 | 7640 | 7638 | 763 | 7634 | 7632 | 76 | 76 | 76 | 7625 | 6450 | 45 | 545 | 645 | 645 | 6461 | 646 | 6466 | 468 | 6470 |  |
|  |  | 52 | 5276 | 52 | 5268 | 5265 | 526 | 52 | 52 | 1.5250 | －2900 |  |  | 2914 | 2918 | 292 | 2927 | 2931 | 236 |  |  |
|  |  | 29 | 29 |  | 2903 | 2897 | 28 |  | 咗 |  |  | 93 | 9364 |  | 937 | 9384 |  |  |  |  |  |
|  | 0567 |  | 0552 | 0544 | 053 |  | 25 | 0514 |  |  | 2.5801 |  |  |  | 58 | 5845 | 58 | 5863 | 72 |  |  |
|  | 8209 | 8199 |  |  | 8171 | 8162 | 81 | 8143 | 813 | 3.8 | 3．2 | 2262 | 2273 | 2284 | 2295 | 2306 | 2317 | 2328 | 2339 |  |  |
|  | 5850 | 5839 | 5828 | 5816 | 5805 | 5794 | 5783 | 5771 | 5760 | 4.5749 | 3.8 | ｜8714 | 8727 | 8741 | ${ }^{8754}$ |  | 81 | 4 |  |  |  |
|  | 3492 | 3479 | 3466 | 3453 | 3439 | 3425 | 3413 | 3400 | 3387 | $5 \cdot 3374$ | 45151 | 5166 | 5182 | 5198 | 5213 | 5229 | 17244 | 17250 | 275 | 176 |  |
|  | 1134 | 111 | 1104 | 108 |  | 1059 | 1044 | 1029 | 1013 | 6．0998 | 5.1601 | 1619 | 1637 | 1654 | 1672 <br> 8131 | 1690 8151 | 1708 | 1725 | $1 \begin{aligned} & 1743 \\ & 8211\end{aligned}$ | ${ }_{82}^{176}$ |  |
| 10 | 8775 6417 | 8759 6398 | 6380 |  |  | 6323 | 析 8674 | 6286 | 6267 | 7．6248 | 5.8051 6.4501 | 8071 4524 | 8091 4546 | $\begin{aligned} & 8111 \\ & 4568 \end{aligned}$ | $\begin{aligned} & 8131 \\ & 4590 \end{aligned}$ | $\left\|\begin{array}{l} 8151 \\ 4612 \end{array}\right\|$ | 8171 4635 | 8191 4657 | 8211 4679 | 823 |  |
| 11 | 4059 | 403 | 40 |  |  |  |  |  |  | 838 | $7 \cdot 0951$ | 097 |  | 1025 | 1049 | 1074 |  |  | 1147 |  | 1 |
| 12 | 170 | 167 | 16 | 163 |  | 1588 | 15 | 15 | 15 | 9．149 | 774 | 7428 | 7455 |  | 7508 | 7535 |  |  |  |  |  |
| 13 | 9342 | 93 |  |  | 92 |  | 9196 | 971 | 147 |  |  |  | 3910 |  | 3967 | 3996 | 402 |  |  |  | 13 |
| 14 | 6984 | 695 | 6931 | 6905 | 79 | 6853 | 6826 | 6800 | 6774 | 10.6747 | 9．0302 | 0373 | 0364 | 0395 | 0426 | 0457 | 0488 | 0520 | 0551 |  | 14 |
| 15 | 4626 | 49 | 4569 | 4541 | 4513 | 4485 | 445 | 4428 | 4400 | 114372 | 6752 | 6785 | 6819 | 6852 | 6885 | 6919 |  | 5 |  |  | 5 |
| 16 | 2267 | 223 | 2207 | 2177 | 2147 | 2117 | 208 | 2057 | 2027 | 12．1997 | $10 \cdot 3202$ | 3238 | 3273 | 33 | 3344 | 3380 | 3415 | 3451 | 86 | 3522 | 16 |
| 17 |  | 98 | 98 | 13 | 716 | 9750 | 9718 | 9686 | 9654 | 12.9622 | 10.9652 | 9690 | 9728 | 9766 | 9803 | 9841 | 9879 | 9917 | 9954 |  | 17 |
| 18 | 7551 | 75 | 74 |  | 7416 | 73 | 73 | 7314 | 72 | $13 \cdot 7246$ | 11.6102 | 6142 | 6182 | 62 | 6262 | 6302 | 342 |  | 642 |  | 18 |
| 19 | 51 | 51 | 512 |  |  | 5014 |  | 49 | 4 |  | 12. | 25 | 263 |  |  |  |  | 2 |  |  | 19 |
| 20 | 283 | 27 | 2759 | 2722 | 2684 | 2647 | 2609 | 25 | 2534 | 15.24 | 12 19003 | 9047 | 909 | 913 | 91 | 92 | 9269 | 93 | 9358 |  | 20 |
| 21 | O4， | 04 | 03 | 0358 |  | 02 | 02 |  | 0160 | 16.0121 | $13 \cdot 5$ |  |  |  |  |  |  |  |  |  |  |
|  | 81 | 80 |  | 7994 |  | 79 | 78 | 7828 | 7787 | 16.77 | 14.1 | 195 |  |  |  | 21. | 21 | 2245 | 23 |  | 22 |
|  | 575 | 57 | 5673 | 5630 | 5587 | 5543 | 55 | 5457 | 5414 | 17.53 | 14 －8 | 84 |  |  | 8557 |  |  | 8711 | 8762 |  | 23 |
| 24 | 340 | 33 | 3311 |  |  |  | 3131 | 308 | 3040 | 18.2995 | 15.4803 | 4857 | 491 | 496 | 5016 | 50 | 512 | 5176 | 5230 |  | 24 |
| 25 | 1043 | 099 | 09 | 0902 | 0855 | 0808 | 10761 | 07 | 06 | 19.0620 | 16.1253 | 1309 | 136 | 142 | 1475 | 153 | 158 | 1642 | 1697 |  | 25 |
| 27 | 8685 | 86 | ${ }^{85}$ | 8538 | ${ }^{84}$ | 84 | ${ }^{83}$ | ${ }^{83}$ | ${ }^{8294}$ | 19.82 | 16.7703 | 7761 | 7819 | 78 | 7934 | 7992 | 805 | 18108 | 8165 | ${ }^{8223}$ | ${ }^{26}$ |
|  | 63 | 62 |  |  | 61 |  |  |  |  | $20 \cdot 5$ | 17.4154 | 4214 | 4274 | 43 | 4394 | 4553 | 451 | 4573 | 463 |  |  |
| 28 | 39 | 39 | 3863 |  |  |  |  | 36 | 3547 | 21 | 18.06 | 0666 | 07 |  | 0853 | 091 | 093 | 103 |  |  | 28 |
|  |  |  |  |  |  |  |  |  | 1174 | 2 | 18.7 | 71 | 71 |  | 73 | 73 | 7440 | 7505 | 7569 |  | 29 |
| 30 | 925 | 919 | 9139 |  |  | 8970 | 8913 | 8857 | 880 | 2 | 19.35 | 357 |  | 37 | 37 | 3837 | 3904 | 3970 | 4037 | 4103 | 30 |
| 31 | 689 |  |  | 6719 |  |  |  |  | ${ }^{642}$ | 63 | 19.99 | 1023 | 009 |  | 0230 | 10298 | 0367 |  |  |  |  |
| 32 | 453 | 447 | 44 | 4355 |  |  |  |  | 4054 | 24 |  |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 2171 | 21 | 20 |  |  | 1867 | 1805 | 173 | 1681 | 25.16 | 21.2854 | 292 | 30 | 30 | 31 | 32 | 32 | 3367 |  |  | 33 |
| 34 | 987 | 97 | 96 | 9627 |  | 9499 | 94 | 933 | 9307 | $25^{\circ} 92$ | 21.93 | 938 | 9 | 95 |  | 9682 | 97 | 9833 |  |  | 34 |
| 35 | 7460 | 739 | 7329 | 7263 | 197 | 7131 | 706 | 7000 | 6934 | $26 \cdot 6868$ | 22．5755 | 583 | 591 | 59 | 60 | 6143 | 62 | 6299 | 6376 | 6454 | 35 |
|  | 5102 | 5034 | 4967 | 4899 | 48 | 4764 | 4696 | 4628 | 4561 | 27.449 | ${ }^{23 \cdot 2205}$ | 228 | 236 |  |  | 260 | 26 | 2764 |  |  | ${ }^{36}$ |
| 37 | 27 | 26 | 26 |  |  | 2396 |  |  | 21 | 28.21 |  |  |  |  |  |  |  |  |  |  | 37 |
|  | 03 | 03 |  |  |  |  |  |  | 981 | $28^{\circ} 9$ |  |  | 52 |  |  | 55 |  |  |  |  | 38 |
| 39 |  |  |  |  |  |  |  |  |  |  | $25 \cdot 1$ | 1642 |  |  |  |  | 2075 | 2161 | 2248 |  | 39 |
| 40 | 56 | 5594 | 5518 | 5463 | 5368 | 5293 | 5218 | 5143 | 5067 | 30－4992 | $25 \cdot 800$ | 809 | 818 | 827 | 836 | 8450 | 8538 | 86 | 87 |  |  |
| 41 | 3310 | 3233 | 3156 | ｜ 3079 | 3002 | 2925 | 2848 | 2771 | 2694 | 31.261 | $26^{\circ} 4455$ | 4547 | 463 | 472 | 482 | 4911 | 50 | 509 |  |  | 41 |
| 4 |  | 08 | 0794 | 0715 |  | 05 | 04 | 0400 | ${ }^{0321}$ | 32.02 | $27 \cdot 73$ | 7 |  | 11 | 127 | 1372 | 14 |  |  |  | 42 |
| 43 | 85 | 85 | 8432 | 8352 | 82 | 8190 | 81 | 80 | 7947 | $32 \cdot 78$ | $27 \cdot 7356$ | 745 | 75 |  |  | 78 | 仡 | － |  |  | 63 |
|  |  | 61 | 60 |  |  |  |  | 56 |  |  |  |  | 400 |  | 419 | 42 | 43 | 449 | 4588 |  | 44 |
| 45 | 387 | 37 | 37 | 3624 | 3539 | 3455 | 3370 | 3285 | 3201 | 34 | $22^{\circ}$ | 0356 | 04 | 05 | 0656 | 07 | 0856 | 09 | 1055 | 1155 |  |
| 46 | 1519 | 14 | 13 | 1260 | 1173 |  | 00 | 0914 | －827 | 35.0741 | 29.67 |  |  |  |  |  |  |  |  |  |  |
| 47 | 91 | 90 | d | 885 |  | 8719 | 8631 | 8543 | 8454 | 35．8366 | $30 \cdot 31$ | 32 | 33 | 347 | 3574 | 3678 | 378 |  |  |  | 47 |
| 48 | 68 | 67 | 6622 |  |  | 6352 | 6261 | 6171 | 6081 | ， |  | 97 |  |  | －033 | 0140 | 024 | 0353 |  |  | 48 |
|  |  | 43 | 4260 | 矿 |  |  | 352 | 3800 | 3707 | 7．36 | 31.6056 | 6165 | 6274 | 6383 | 6492 | 6601 | 6710 | 6818 | 338 |  | 49 |
| 50 |  | 199 | 1898 | 04 | 1710 | 1616 | 1522 | 1428 | 1334 | 38.1240 | $32 \cdot 2507$ | 2618 | 2729 | 2840 | 295 | 3062 | 317 | 3284 | 339 | 3506 | 50 |
| 51 | 972 | 963 | 19536 | 9440 | 9344 | 9249 | 1953 | 9057 | 18961 | 38.8 | 32．8957 | 907 | 918 | 9297 | 941 | 9523 | 96 | 975 |  |  |  |
| 52 |  | 72 | 7174 |  | 6979 | \％ | 6783 | 6685 | 6588 | 39.64 | $33 \cdot 54$ | 552 | 56 | 575 | 589 | 5984 | － | 621 |  |  | 52 |
|  |  | 49 | 48 | 4712 |  | 4 | 441 | 431 | 421 |  | $34 \cdot 1$ | 1975 | 20 | 22 | 232 | 2446 | 256 | 26 |  |  | 5 |
| 54 | 265 | 25 |  |  | 2247 | 2146 |  |  |  | 41.1 |  |  |  |  |  |  |  |  |  |  | 54 |
| 55 | 0294 | 01 | －088 | 9985 | 9881 | 9778 | 9674 | 9571 | 9468 | 41.93 | 35 | 4880 | 5002 | 5124 | 5246 | 5368 | 5490 | 5612 | 5734 | 5856 |  |
| 56 | 793 | 783 |  |  |  |  |  | 7200 | 7094 | 42 | 36.12 | 133 | 145 | 158 | 170 | 182 | 195 |  |  |  | 56 |
|  | 557 | 547 | 5364 | 5257 | 51 |  | 4935 | 4828 | 4721 | 43.46 | 36.76 | 778 | 791 | 803 | 8164 | 829 | 8417 | 8544 | 8670 |  |  |
| 58 | 32 | 31 |  |  |  |  | 2566 | 2457 | 2348 | 44：2239 | 37.4108 | 423 | 436 | 4494 | 4623 | 4752 | 488 | 1 | 5138 |  | 58 |
| 59 | 08 |  |  | 0529 | 0418 | 0307 | 0196 | －085 | 9974 | 44.9863 | $38^{\circ} 0558$ | 068 | 082 | 095 | 1082 | 1213 | 134 | 1475 | \％ |  | 59 |
| 60 | 8503 | 8390 | 8278 | 65 |  | 20 | 7827 | 7714 | 7601 | 45748 | $38 \cdot 7008$ | 7141 | 7275 | 7408 | 754 | 767 | 780 | 941 | 807 | 82 | 60 |
|  |  |  | 5916 |  |  | 55 | 5457 |  |  |  | 39.34 | 35 |  |  | 400 | 413 | 42 |  |  |  |  |
|  |  | 36 | 355 | 3437 |  | 32 | 307 | 297 |  |  |  |  | 1 |  | 645 | 059 | 71 | 087 |  |  | 62 |
| 63 | 142 | 13 | 1191 | 107 | 09 | 083 | 071 | 0600 | 048 | 48.03 | $40^{\circ} 6$ | 64 |  |  | 6918 | 705 | 71 | 73 |  |  | 63 |
| 65 |  |  |  |  |  | 8469 <br> 6101 |  | 8228 | 8108 | 49.5612 |  | 941 | ${ }^{3093}$ | 3235 | 983 | 13519 |  |  | 3945 |  | ${ }_{65}^{64}$ |
| 65 | 671 |  | 64 | 35 | 6223 | 673 | 5979 | 5857 | 5734 | 49.5612 | 41．9259 | 94 | 5 | 963 | 983 |  | ${ }^{1}$ |  | 04 |  |  |
| 66 | 4353 | 4229 | 4105 | 3981 | 3857 | 3733 | 3609 | 13485 | $\mid 3361$ | 50＇3237 | 42.570 | 5855 | 6002 | 6149 | 6295 | 6442 | 658 | 6735 | 6881 | 7028 | 66 |
| 67 |  | 18 | 1703 | 161 |  |  | 128 | 1114 | 9988 | 51.08 | 43.21 | 238 | 243 |  | 2754 | 2903 | 305 | 3200 |  |  | 67 |
|  |  | 95 | 93 | 9254 | 9126 | 89 | 887 | 8742 | 8614 | 51.84 | 43.86 | 87 | 891 |  | 9213 | 936 | 95 | 960 | 981 |  | 68 |
| 69 | 727 | 71 | 70 |  |  |  | 6501 | 6371 | 624 | 52 | $44 \cdot 5$ | 52 | 53 | 55 | 561 |  |  |  | 62 |  | 69 |
| 70 | 49 | 4789 | 4657 | 4526 | 4394 | 426 | 4131 | 3999 |  | 33．373 | 45＇1509 | 16 | 182 | 1976 | 2131 | 2287 | 244 | 25 | 27 |  |  |
| 71 |  | 24 | 2295 | 216 |  |  | 1762 |  |  | 54．1361 | 45＇7959 |  |  |  |  |  |  |  |  |  |  |
| 72 | 023 | ＋0 | 9933 | 979 | 96 |  | 939 | 9257 | 9121 | 54－89 | $46^{\circ} 44$ | 4570 | 473 | 48 | 504 | 52 | 53 |  |  |  | 72 |
| 73 | 7845 | 77 | 757 | 7434 | 7297 | 716 | 7022 | 6885 | 6748 | 55.661 | $47^{\circ} \mathrm{OB}$ | 10 | 1184 | 13 | 1508 | 1671 | 183 | 1995 | 2157 | ${ }^{2318}$ | 73 |
|  |  | 53 |  |  |  |  | 46 | 45 | 4375 | $56 \cdot 4235$ | $47 \cdot 7310$ | 72 | 763 |  | 96 | 8132 | 82 | 820 |  |  | 74 |
| 75 | 312 | 2988 | 2847 | 2706 | 2565 | 242 | 2283 | 2142 | 2001 | 57／1860 | 48.3760 | 392 | 409 | 426 | 442 | 4593 | 476 | 42 | 5092 | 5259 | 75 |
| 76 | 077 | 06 | 0485 | ${ }^{0342}$ | 0200 | ${ }^{18} 057$ | 99 | 9771 | ${ }^{9628}$ | 57．948 | 49.02 | 037 | 05 | 717 | \％ | 1054 | 122 | 1392 |  |  | 76 |
| 77 | 841 | 82 | 81 | 7918 | 7834 | 7689 | 75 | 73 | 725 | 58.711 | 49.66 | 683 | 70 | 71 | 73 | 7515 | 76 | 7 |  |  | 77 |
|  | 60 |  | 57 | 56 | 5468 | 532 | 517 | 50 | 48 | 59.47 | $50 \cdot 3$ | 321 | 34 | 36 | 388 | 397 | 41 | 43 |  |  | 78 |
| 79 | 36 |  |  |  |  |  |  | 2657 |  |  |  |  | 99 | 65 | 672 | 043 |  |  |  |  | 79 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 6722 |  | 707 |  |  |  | 80 |
| 82 | 662 | 646 | 6313 | 615 | 6005 | 5851 | 5696 | 5542 | 5388 | 62．5234 | 52．8911 | 9093 | 9275 | 9457 | 9640 | 9822 | ＋00 | 186 |  |  | 82 |
| 83 | 426 | 417 | 39 | 3795 | 3639 | 3483 | 3327 | 3171 | 3015 | 63.285 | 53．5361 | 5545 | 573 | 59 | 2095 | ${ }^{6783}$ | ${ }^{646}$ | 6651 | 6836 |  | 83 |
| 84 | 190 | 1746 | 1589 | 1431 | 127 | 1115 | 0957 | 0799 | 0641 | 64．0483 | 54．1811 | 1998 | 218 | 237 | 2558 | 274 | 293 | 311 | 3731 |  | 84 |
| 95 | 954 | 9386 | 9227 | 9067 | 8907 | 8748 | 8588 | 8428 | 8268 | 64：8108 | 54 \％261 | 8450 | 863 | 8828 | 9017 | 9205 | 939 | 958 | 977 | 99 | 85 |
| 86 | 718 | 7026 | 685 | 仿3 |  |  | 6218 | 605 | 5895 | $65 \cdot 573$ | $55 \cdot 4711$ | 4903 | 509 | 52 | 5476 | 5667 | ${ }^{585}$ | 6048 |  |  |  |
|  | 482 | 466 | 4503 | 4339 | 4176 | 4012 | 3849 | 3685 | 3521 | 66.3358 | $56 \cdot 1161$ | 1355 | 154 | 17. | 1935 | 2128 | 232 | 2514 | 27 |  |  |
| 88 88 88 | ＋11 | 23 | 21 |  |  | 164 | 1479 | 1314 | 1148 | $67^{\circ} 0$ | 56.7 | 78 |  | 819 | 8394 | 5 | 8784 |  |  |  | ${ }^{88}$ |
| 90 | ＋11 | 75 | $\left\lvert\, \begin{aligned} & 9778 \\ & 7416\end{aligned}\right.$ | 7247 |  |  | 9110 | 657 | 6401 | $67 \cdot 8607$ $68 \cdot 6232$ | 57＇4062 | ${ }_{0}^{4261}$ | 4457 0912 | 1112 | ${ }_{1312}^{485}$ | 1512 | 1771 | 1941 | 21 |  |  |
| 91 | 539 | 52 | 5054 | 48 | 4713 | 4542 | 4370 | 4199 | 4028 | 69 ＇3857 | 58.6962 | 7164 | 73 | 756 | 7771 | 7973 | 8175 | 8377 | 8579 |  |  |
| 92 | 3036 | 28 | 2692 |  |  | 2174 | 2001 | 1928 | 1655 | 71482 | 593412 | 3617 | 382 | 40 | 4230 | 4434 | 4638 | 487 | 5047 | 525 |  |
| 93 | 067 | 0505 | 0330 | 156 | 15 | 9806 | 9631 | 9456 | 9288 | 70.9107 | 59.9862 | ．069 | 027 | 04 | ${ }^{068}$ | 0895 | 170 | 130 | 15 | 121 | 93 |
| 94 | 8321 | 8145 |  |  | 715 | 7439 | 7262 | 7085 | 6908 | 71.6731 | 60.6312 | 652 | 673 | 693 | 7148 | 7357 | 756 | 7774 |  |  | 94 |
| 95 | 5963 | 5785 | 5606 | 5428 | 5249 | 5071 | 4892 | 4714 | 4535 | $72 \cdot 435$ | 61．2763 | 2974 | 3185 | 339 | 36 | 3818 | 4029 |  |  | 461 |  |
| 96 | 360 | 342 | 32 |  | 2884 |  | 2523 | 23 | 2162 | $73 \cdot 198$ | 61.92 | 942 | 963 | 98 |  | －0279 | 0492 | ${ }^{07}$ | 0918 |  |  |
|  | 12 | 10 | 08 | 0700 | 0518 | 0336 | －153 |  | 9788 | 73.96 |  | 587 | 609 | 63 | 65 | 6740 | 69 |  |  |  |  |
| 98 98 |  |  |  |  |  |  |  |  | 7415 | 5， | ¢ 21 | 2331 |  |  |  |  | 3419 |  |  | 407 |  |
| 100 | 6530 | 6344 <br> 3984 | 3796 | 3608 | 3420 | 3233 | 3045 | 2856 |  | 76：2480 | $63 \cdot 8563$ <br> 64.5013 | 5236 |  |  | 5902 | 6124 | 6346 |  |  |  |  |
|  | 50 | 49 | 48 | 47＇ | $46^{\prime}$ | $45^{\circ}$ | $44^{\prime}$ | 43 | $42^{\prime}$ | ， | $50^{\prime}$ | 49 |  | $147^{\prime}$ | $46^{\prime}$ | $45^{\circ}$ | $44^{\prime}$ | $43^{\prime}$ | ＇ | 4 |  |
|  |  |  |  |  | Sin |  |  |  |  |  |  |  |  |  |  | SINE． |  |  |  |  |  |

TRAVERSE TABLES.

| $40^{\circ} \quad$ Cosin |  |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }_{286}^{528}$ |  |  |  |  |  | 5219 |  |  |  |  |  |  |  |  |  |  | 2980 |  |  |
|  |  | O484 | 0477 | 0.469 | ${ }^{2062}$ | ${ }^{0.4545}$ | ${ }_{0}^{0468}$ | 043 | 043 |  |  |  |  |  |  | ${ }_{2934}^{594}$ |  |  | 5960 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{847}$ | 8861 |  | 18887 |  |  |  |  |  |  |
|  |  | $\begin{gathered} 5726 \\ 3367 \end{gathered}$ | 3334 | 332 |  |  |  |  |  |  |  |  |  |  |  |  |  | 5415 |  |  |  |
|  |  |  | 093 | O938 |  | 0908 | 089 | 78 | ${ }^{0865}$ |  |  | 1796 | 1814 | 1832 | 1850 | 1867 | 1885 |  |  |  |  |
|  |  |  | 8572 | 8, 8173 | 8538 | (8521 | 8, $\begin{aligned} & 804 \\ & 611\end{aligned}$ |  | 8487 |  |  | ${ }^{8277} 4$ | 1829 | 8311 4790 | ${ }_{\text {l812 }}^{833}$ | ${ }_{4834}^{835}$ | ${ }_{4856}^{837}$ | 8391 |  |  |  |
|  |  | 3831 | 3811 | 379 | 376 | 3748 |  | 3707 |  |  |  | ${ }^{1220}$ | ${ }^{1244}$ | 1269 | ${ }^{1273}$ |  | ${ }^{1342}$ | ${ }^{366}$ |  |  |  |
|  | 12 | 1455 | 1430 |  | 1385 | ${ }^{1362}$ | 1339 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 6695 | 668 | 66 | 6615 | 6589 | 6563 | 653 | 6510 |  |  |  |  | ${ }^{2} 206$ | 0737 |  | 0799 |  |  |  |  |
|  | ${ }_{5}^{4} 434$ |  |  |  | 423 | 4202 | 4174 | 4146 | 418 |  |  |  |  |  | 721 |  | 7284 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3770 | ${ }^{3805}$ | 831 |  |  |
| $17$ |  |  | 71 |  |  | ${ }^{2} 924$ | 700 |  |  |  |  |  |  |  |  |  |  |  | 821 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 318 |  |  |  |  |  |
|  | 1008 | 0042 | 100 |  |  |  |  |  |  |  | 1359 | 5966 | 5 | 5059 | 1105 | 6152 | 6198 | 6245 | \|6291 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | ${ }_{5389}$ |  | 549 |  |  |  | 5708 |  |  |  |
|  | 25057 |  |  |  |  | 0337 | 0290 |  |  |  |  | 1864 |  | 1975 | 2030 | 2085 | 41 |  |  |  |  |
|  |  | $\begin{aligned} & 8147 \\ & 8768 \end{aligned}$ | 80 | 80 |  |  |  |  |  |  | $6 \cdot 8$ | ${ }^{83}$ |  | 8454 | 851 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 928 | ${ }^{3236}$ | 3791 |  |  |  |  |  |  |  | 7891 | ${ }_{7} 795$ |  | 8983 | ${ }_{8147}^{1400}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 63 | 6252 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 013 | 021 |  |  |  | 0511 |  |  |  |  |
|  |  | 673 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 4154 | 488 | 4018 |  | 382 |  |  |  | 164 | ${ }^{3243}$ |  |  |  |  |  |  |  |
|  |  |  | 952 | 9456 | 9385 | 931 | 922 | 1970 | 195 |  |  |  | 417 | 6201 |  |  | 54 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2489 |  |  |  |
|  | 45408 |  | 52 | 51 |  | 49 | 49 |  | 474 |  |  |  | 4978 | 5075 | 517 |  | ${ }_{5388}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 039 |  |  | 17 |  |  |  |  |  |  | 8033 |  |  |  |  |  |  |  |
|  |  |  |  | 56 | ${ }_{5}^{533}$ | 546 | 5357 | ${ }_{5257}^{7057}$ | ${ }_{5}$ |  |  |  | ${ }^{24885}$ | 2991 | ${ }^{6}$ | 20 | ${ }^{283} 18$ |  |  |  |  |
|  | 52 |  |  | 324 | 3154 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{5} 4$ |  |  |  |  |  |  | 33 |  |  |  | 3151 | 3269 | 3386 3 |  |  |  |  |  |  |  |
|  |  |  | ${ }_{205}$ | 8950 | ${ }_{8846}$ | 8742 |  |  | 8431 |  |  |  |  | 6344 |  |  |  |  |  |  |  |
|  |  | ${ }^{6778}$ | ${ }^{663}$ | ${ }_{4}^{6567}$ | $\left\|\begin{array}{l}6661 \\ 4077\end{array}\right\|$ | 淅366 | -6250 | ${ }^{6145}$ | ${ }^{6039}$ |  |  | ${ }^{2575}$ | ${ }^{2699}$ | ${ }^{2823}$ | ${ }^{2947}$ |  | 3195 | 3319 | 13433 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 997 |  |  | 94 | 930 |  |  | 897 | 886 |  |  |  |  | 22 | 239 |  |  | 278 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{2244}$ | 01 | ${ }^{2}$ | ${ }_{9888}$ | 9769 | 965 | 953 | 9413 | 9294 |  |  | 7897 | 8036 | 8176 | ${ }_{8316}$ | 8455 | 8595 | ${ }_{8734}$ | 8874 |  |  |
|  |  |  |  | 7505 | 7585 | 1254 | 435 | 202 | ${ }^{6902}$ |  |  | 4 | 451 |  |  |  |  |  |  |  |  |
|  |  | 2988 |  | 27 | 2615 |  | 2366 |  | 217 |  |  | 732 | 7467 | 7613 | 7759 | 7905 | 8051 | ${ }^{819}$ | ${ }^{8344}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 5591 | ${ }_{5461} 84$ | 5331 | 52 | 507 | 494 |  |  | 674 |  |  |  |  | 750 | 7661 |  |  |  |
|  | ( 3604 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 1096 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{3} 386838$ | ${ }_{6336}$ |  | ${ }^{2}$ | 59 | 57 | 56 | 5510 | ${ }_{53} 7$ |  |  | ${ }^{2642}$ | 280 |  |  |  |  | 3612 |  |  |  |
|  | ${ }_{5}^{4} 5$ |  |  |  |  |  |  | 072 | ${ }^{298}$ |  | $48^{5}$ | 559 |  | ${ }_{592}^{294}$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{19} 9$ |  |  | 1784 | ${ }_{921}^{1961}$ | 9080 | 1329 |  |  |  | 1.72 |  | 114 |  |  |  |  |  |  |  |  |
|  | 3173466 | ${ }^{2304}$ |  |  |  |  |  |  | ${ }^{6235}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }_{84} 0325$ | 01 |  | 9851 |  | 9534 | 93 |  | 905 |  |  | 368 | 404 | 423 | 442 | 460 | 4793 | 497 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 86 | 5409 |  | 508 | 929 |  |  |  |  |  |  |  |  |  |  |  | 125 |  |  |  |  |
|  | 0817 |  |  | 03 | ${ }_{124}$ | 99 | 98 | 96 | 949 |  |  | 976 | 99 | 115 |  |  |  |  |  |  |  |
|  | 3984 |  |  |  |  |  |  |  | 709 |  |  | ${ }^{623}$ |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 91368 | 351 | 33 | 317 |  | 282 |  |  | 31 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 893 |  |  | 84 | ${ }^{0} 815$ | ${ }^{1} 8$ | 780 | 77 | 752 |  |  | 21 | 2339 | ${ }^{25}$ |  | 2958 | ${ }^{6163}$ | 386 |  |  |  |
|  | 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 961800 |  | $194$ | 125 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 97 |  |  |  |  |  | ${ }^{8328}$ | ${ }_{5753}^{8143}$ | 596 |  |  | ${ }_{450} 8$ | ${ }^{82485}$ | 4964 | ${ }_{5}^{867}$ | ${ }_{538}^{889}$ | 559 | 5889 | 6025 |  |  |
|  |  | ${ }^{4} 483$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | ${ }^{135}$ | 34 | 33 | 32 | ${ }^{31}$ |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $40^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $40^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | 33 | 34 | $35^{\prime}$ | $36^{\prime}$ | 37＇ | $38^{\prime}$ | $39^{\prime}$ | $30^{\prime}$ | $31^{\prime}$ | $3{ }^{\prime}$ | $33^{\prime}$ | $34^{\text {i }}$ | 35 | $36^{\prime}$ | 37 | 38 |  |  |
|  | 760 | 7602 | 7600 | 7598 | 7596 | 7595 | 7593 | 7591 | 7589 | 758 | 6494 | 6497 | 6499 | 6501 | 6503 | 6506 | 65 | 6510 | 6512 | 6514 |  |
|  | 520 | 5204 | 5201 | 51 | 51 | 51 | 5 | 51 | 5178 | ． 51 | 29 | 2993 | 2998 | 3002 |  | 3011 | 30 | 3020 | 3024 |  |  |
|  | 2812 | 280 | 280 | 27 |  | 27 | 2 |  | 276 | 2.27 | 9 | 9490 | 949 | 950 | 951 | 9517 | 9523 | 9530 | 9536 |  |  |
|  | 0416 | 0409 | 0401 | 039 | 038 | 0378 | 0371 |  | 035 |  |  | 598 | 599 | 600 | 601 | 602 | 6031 | 6040 | 60 | 6057 |  |
| 5 | 8020 | 8011 | 800 | 7992 |  | 7973 | 79 | 7954 | 7945 | 3.7935 | $3 \cdot 2472$ | 2483 | 2495 | 25 | 25 | 2528 | 2539 | 2550 | 256 | 2572 |  |
| 6 | 5624 | ＋5613 | 5602 | 559 | 5579 | 5568 | 55 | 55 | 55 | 55 | 3.8967 | 8980 | 8993 |  | 9020 | 9033 | 946 | 9060 |  |  |  |
|  | 32 |  |  |  |  |  |  |  |  |  |  | 5477 | 5492 | 550 | 5 | 55 | 5554 | 5570 | 5585 |  |  |
|  | 0832 | 08 | 0802 | 0787 | 07 | 0757 | 0742 | 0727 | 0711 | ．06 | $5 \cdot 1956$ | 1974 | 199 | 200 | 20 | 2044 | 2062 | 208 | 20 |  |  |
|  | 84 |  |  |  |  |  |  |  |  | 6.828 |  | 8470 | 849 | 85 | 85 | 8550 | 70 | 8590 | 8609 |  |  |
| 10 | 604 |  |  |  |  |  |  |  |  |  |  | 967 |  | 50 | 5030 | 5055 | 5077 | 510 | 5122 | 514 | 10 |
| 11 | 36 | 3624 | 3603 |  | 3561 |  | 3520 |  | 347 | 8．345 | ． 1439 |  | 488 | 1512 | 1537 | 7561 | 1585 | 1609 | 1634 |  | 11 |
| 12 | 124 | 12 | 12 |  | 1758 |  | 1113 |  |  |  |  |  |  | 80 | 80 | 80 | 8093 | 81 |  |  | 12 |
| 13 | 8853 |  |  | 87 | 8754 | 87 |  |  | 8656 |  |  | 4457 | 4486 | 4514 | 4543 | 45 |  | 4629 | 4658 | 468 | 13 |
| 14 | 6457 | 643 | 6404 | 63 | 6351 | 6324 | 62 | 6271 | 245 | 10.62 |  | 0954 | 0985 | 1016 | 10 | 1077 | 1108 | 1139 | 1170 | 120 | 14 |
| 15 | 406 | 403 | 4004 | 3976 | 3947 | 311 | 38 | 88 | 3834 | 11.380 | 974 | 7450 | 7484 | 7517 | 75 | 7583 | 716 | 7649 | 7682 |  | 15 |
| 16 | 166 |  |  |  |  |  |  |  |  |  | 10 |  |  |  |  |  |  |  |  |  | 16 |
| 17 | 926 |  |  | 9173 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 | 687 | 68 | 6805 | 677 | 6737 | 670 | 66 | 6 |  | 13 | 11 | 6940 | 6980 | 7020 |  | 71 | 7139 | 7179 | 7219 |  | 18 |
| 19 | 447 |  |  |  | 4333 | 423 | 4 | 4 | 90 | 14. | 12 | 34 | 3479 | 3521 | 3563 | 3605 | \％ | 3689 |  |  |  |
| 20 | 208 | 2043 |  | 1968 | 30 | 18 | 1854 | 1816 | 1779 | 15．1741 | 12 | 9934 | 9978 | －02 | 00 | 011 | 015 | 0199 | 024 | 028 | 20 |
| 21 | 968 | 9646 | 9606 | 9566 | 9526 | 9487 | 9447 | 9407 | 9367 | 15 | 13.6 | 643 | 6477 | 6523 | 65 | 661 | 6663 | 6709 | 675 | 680 | 21 |
| 22 | 72 |  |  |  | 7123 |  |  |  |  | $16^{\circ} 69$ | 14.2879 |  | 2976 | 302 |  |  |  |  |  |  | 22 |
| 23 | 489 | 4850 | 480 | 4763 | 4719 | 4676 |  |  | 4545 | 17. | 14.9373 | 24 | 9475 | 95 |  | 9627 | 9678 | 972 |  |  | 23 |
| 24 | 24 | 245 | 24 | 2361 | 2316 | 227 | 2225 | 2180 | 2134 | 18 | 15 |  | 59 | 60 | 6080 | 61 | 618 | 6239 | 629 | 634 | 24 |
| 25 | 0102 |  |  |  |  | 9865 |  |  |  | 18.9676 | 16 | 2417 | 247 | 2528 | 2583 | 2638 | 2694 |  | 2804 | 2859 | 25 |
| 26 | 77 |  |  |  |  |  |  |  |  |  |  |  | 8971 |  |  |  |  |  |  |  | 26 |
| 27 | 531 | 52 | 5208 |  | 5105 |  |  |  |  | 20 |  |  | 54 | 5530 |  |  |  |  | 582 |  | 27 |
| 28 | 29 | 28 | 2808 | 2755 | 2702 | 2649 | 259 |  | 2490 | 21 | $18^{\circ}$ | 1907 | 19 | 20 |  |  | 2217 | 227 | 23 | 240 | 28 |
| 29 | 051 |  |  |  |  |  |  |  | 0079 | 22.00 | 18.8 | 8404 | 846 | 85 |  |  | 8725 | 878 |  | 89 |  |
| 30 | 812 | 80 | 8008 | 52 | 7895 | 783 | 7781 | 772 | 668 | $22 \cdot 76$ | 19.4 | 49 | 496 | 503 | 51 | 516 | 523 | 529 | 53 | 543 | 30 |
| 31 | 57 | 5667 | 5609 | 5550 | 5491 | 5433 | 5374 | 5315 | 5257 | 23.519 | 20 | 139 | 1466 | 1535 | 1603 | 1672 | 1740 | 180 | 187 | 1945 |  |
| 32 | 33 |  |  |  |  |  |  |  |  | 24.27 |  |  |  |  |  |  |  |  |  |  | 32 |
| 33 | 093 |  | 0809 |  |  | 0622 |  |  |  | 25.03 | 21 | 4391 |  |  | 461 | 46 | 475 |  |  |  |  |
| 34 | 85 | 8474 | 8410 | 8345 | 828 | 8217 |  |  |  | $25 \cdot 79$ | 22.0812 | 0888 | 0963 |  | 11 | 11 | 1263 | 133 | 1413 |  | 34 |
| 35 | 6142 | 6076 | 6010 | 5944 | 5877 | 5811 |  | 5679 | 5612 | 26.5546 | $22 \cdot 7307$ | 7384 | 7462 | 7539 | 7616 | 7694 | 7771 | 7848 | 7926 |  | 35 |
| 36 | 37 |  |  |  |  |  |  |  |  |  | 23＇380 |  |  |  |  |  |  |  |  |  |  |
| 37 | 13 |  | 1210 |  | 107 |  |  | 086 |  |  | 24. | 03 |  |  |  |  | 078 |  |  |  |  |
| 38 | 89 |  | 8811 | 873 | 866 |  |  | 8451 |  | $28 \cdot 83$ | 24. |  |  |  | 7126 |  | 729 | 73 |  | 75 | 38 |
| 39 | 655 |  | 6411 | 矿39 | 6263 | 619 | 6116 | 42 | 5968 | $29 \cdot 58$ | 25 | 337 | 34 | 3543 | 3630 | 371 | 380 | 388 |  | S |  |
| 40 | 416 | 40 | 40 |  | 3860 | 378 |  | 633 | 3557 | 30．34 | 25 ＇977 | 986 | 99 | ＋045 | 133 | 022 | 031 | 039 | 048 | 057 | 40 |
| 41 | 17 | 1689 | 1611 | 1534 |  | 1379 |  | 1224 | 1146 | 31 | 26.627 |  |  | 6546 |  | 6727 | 6817 |  | 699 |  |  |
| 42 | 93 |  | 9212 | 9132 |  |  |  | 881 |  |  |  |  |  |  |  | 3232 |  |  |  |  | 42 |
| 43 | 697 | 689 | 6812 | 673 | 664 | 656 | 648 | 640 | 6324 | 32 | $27 \cdot 9263$ | 93 | 94 | 9548 |  | 973 | 933 | و28 | －23 |  | 43 |
| 44 | 457 | 449 | 441 |  | 424 | 416 | 4079 |  | 3913 |  | 28.5757 |  |  |  | 6146 | 6243 | 634 | 643 | 6535 | 66 | 44 |
| 45 | 21 | 2098 | 2013 |  | 1842 | 175 | 1672 | 1587 | 1502 | 34.1416 | 29.2252 | 2351 | 2451 | 2550 | 2650 | 279 | 2848 | 2948 | 3047 |  | 45 |
| 46 | 97 |  |  |  | 943 |  |  |  |  |  | 29.8746 |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 739 |  | 7213 | 7124 |  |  |  |  |  | 35 |  |  |  |  |  |  |  |  |  |  | 47 |
| 48 | 499 |  | 4813 | 4723 | 4632 | 45 | 450 | 359 | 4268 | 36.4 | 31 |  |  |  |  | 226 | 237 | 24 | 25 |  | 48 |
| 49 | 25 | 2506 |  | 2321 | 2228 | 2136 |  | 1950 | 1857 | $37 \cdot 1$ | 31.82 |  | 84 |  | 866 | 877 | 883 | 898 | 909 | 2 | 49 |
| 50 | 020 | 0109 | 1014 | 9919 | 982 | 973 |  | 9541 | 9446 | 37．93 | $32^{\circ} 472$ | 48 | 494 |  | 5166 | 527 | 538 | 549 | 56 | 57 | 50 |
| 51 | 780 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  |  | 5018 |  | 4821 | 4723 | 4624 | 39＇45 |  |  |  |  | 8173 |  | 8403 |  |  |  |  |
| 53 | 301 | 29 | 2815 | 2715 | 26 | 2514 | 2414 | 2313 | 2213 | 40.2 | 34 | 43 | 44 |  | 46 | 47 | 491 | 502 |  |  | 53 |
| 54 | 061 | 05 |  |  |  |  |  |  |  | 40.97 |  |  |  |  | 117 | 129 | 14 | 1537 |  |  | 54 |
| 55 | 82 | 8119 | 8015 |  |  |  |  |  |  | 4 | 35 | 7318 |  |  | 7683 |  |  | 8047 |  |  | 55 |
|  | 58 | 5722 | 5616 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 343 | 3324 |  |  |  |  |  |  |  | ． 2 |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 103 |  |  |  |  |  |  |  |  | － 0 |  |  |  |  |  | 738 | 74 |  |  |  |  |
| 59 | 864 | 8528 | 17 | 305 | 8193 | 808 | 70 | 858 | 7747 | 44.7 | 38 | 330 | 3435 | 3566 | 36 | 382 | 395 | 408 | 4217 | 43 | 59 |
| 60 | 624 | 6130 | 6017 |  | 5790 |  | 5563 | 5449 | 5336 | $45 \cdot 5$ | 38 |  |  |  |  |  | 046 | 0597 | 072 | 086 | 60 |
| 61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 905 | 8937 | 8818 | 86 | 857 | 84 |  | 8222 | 81 | $47 \cdot 7$ | $40 \cdot 9$ |  |  |  | 97 |  | 998 | ＋12 |  | 04 | 63 |
| 64 |  | 6539 |  |  |  |  |  |  |  | 48.55 |  |  |  |  |  |  |  |  |  |  |  |
| 65 | 42 | 4141 |  |  |  |  |  |  |  | 49．31 | 1 |  |  |  |  |  |  |  |  |  | 65 |
| 66 | 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
| 67 | 947 | 93 | 9219 |  |  |  |  |  | 84 | 50．83 | $43 \cdot 5$ |  |  |  |  |  |  |  |  |  |  |
| 68 |  |  |  |  |  |  |  |  |  | 51．591 |  |  |  |  |  | 237 |  |  |  |  |  |
| 69 | 468 | 4550 | 4419 | 428 | 41 | 402 | 3897 | 3767 | 3636 | 52.35 | 44.81 | 827 | 84 | 85 | 87 | 888 | 9034 | 91 | 93 |  | 69 |
| 70 | 228 | 21 | 2020 | 1887 | 175 | 1622 | 1490 | 1357 | 1225 | 53 | $45 \cdot 461$ | 4768 | 4923 | 5078 | 5233 | 538 | 5542 |  |  |  | 70 |
| 71 | 98 |  |  |  |  |  |  |  | 88 | 53.86 |  |  |  |  |  |  |  |  |  |  |  |
| 72 |  |  |  |  |  |  |  |  |  | 54．62 | 4 |  |  |  |  | 839 |  |  |  |  |  |
| 73 | 509 | 495 | 4820 | 46 | 454 | 440 | 4268 | 4130 | 3992 | 55.38 | $47 \cdot 409$ | 42 | 44 | 45 | 4743 | 49 | 506 | 526 | 53 | 55 |  |
| 74 | 270 |  |  |  |  |  |  | 1 | 1581 | 56 | ． 05 |  |  | 1082 | 1246 | 1815 | 57 |  |  |  |  |
| 75 | 030 | 0163 | 21 | 9879 | 97 | 959 | 9453 | 9312 | 169 | 56 | 48.708 | 72 | 74 | 758 | 774 | 791 | 808 | 824 | 84 | 85 | 75 |
| 76 | 7909 |  | 7621 | 7478 | 7334 | 719 | 7046 | ， | 675 |  | 49 |  | 3917 | 40 | 42 | 442 | 458 | 4 | 492 |  | 76 |
| 77 | 551 | 5367 | 5222 | 5076 | 4930 | 4785 | 4639 | 449 | 43 | 58.420 | 50.00 | 0245 | 04 | 0586 | 0756 | 092 | 109 | 126 |  |  | 77 |
| 78 | 172 |  |  |  |  |  |  |  | 1936 |  |  |  | 614 |  | 析 | 砣 | 760 |  |  |  | 78 |
| 79 | 0721 | 0571 | 0422 | 0273 | －123 | 9974 | 22 | 67 | 9525 | 59.9375 | 51．30 | 323 | 3413 | 35 | 3763 | 393 | 4112 | 428 | 448 | 46 | 79 |
| 80 | 832 | 817 | 8022 | 7871 | 7720 | 75 | 7417 | 726 | 7114 | $60^{\circ} 6962$ | 51.9558 | 9735 | 9912 | ＋089 | 026 | 044 | 061 | 079 | 097 | 11 | 80 |
| 81 | 59 |  |  |  |  |  |  |  | 4703 |  |  | 6232 |  |  |  |  |  |  |  |  |  |
| 82 | 353 | 3378 |  | 3068 | 2913 | 2758 | 2602 | － | 29 | 62.213 | 53 | 222 | 2910 | 3091 | 5277 | 34 | 3163 | 381 |  |  |  |
| 83 | 113 | 09 | 08 | 06 | 0509 | 0352 | 0195 | －038 | 988 | 62.9724 | 53.904 | 922 |  | 95 | 9776 | 995 | ＋143 | 032 | 05 | 06 |  |
| 84 | 841 | 研 |  | 26 | 910 | 593 |  | 7629 |  |  | 5536 | 572 | 59 |  | 627 | 646 | 665 | d |  |  |  |
| 85 | 6345 | 84 | 602 | 586 | 5702 | 5542 | 381 | 5220 | 059 |  | 55.20 | 221 | 240 | 259 | 278 | 297 | 315 | 3346 | 3533 | 37 |  |
| 86 | 394 | 3787 | 3624 | 3461 | 3299 | 313 | 2973 | 811 | 648 |  | 55 | 871 | 89 | 909 | 928 | 947 | 966 | 985 | ders | 235 | 86 |
| 87 | 155 | 1389 | 122 | 1060 | 0895 | 073 | 0566 | 0401 | 023 | $66 \cdot 00$ | $56 \cdot 50$ | 52 | 54 | 5597 | 57 | 59 | 617 | 63 | 655 |  | 87 |
| 88 | 9157 | 5503 | 8825 | 8658 | 8492 | 8325 | 8159 | 7992 | 541 | 67. | 57. | ¢20 | 俋 | 859 | 8790 | 2481 | 268 | 288 |  |  | 88 |
| 89 | 6761 | 6593 | 6425 | 62 | 6088 | 5920 | 51 | 5583 | 5414 | $67 \cdot 5246$ | $57 \cdot 800$ | 820 | 84 | 85 | 8796 | 8992 | 9189 | 938 | 95 | 972 | 89 |
| 90 | 43 | 4195 | 4025 | 3855 | 3685 | 3515 | 3344 | 3174 | 300 | 68.2833 | 58.450 | 470 | 4901 | 51 | 5299 | 5498 | 5697 | 5896 | 6094 | 62 | 90 |
| 91 |  |  |  |  |  |  |  |  |  |  |  |  |  | 8161 | S 2 | 25 | 97 | 24 |  |  | 91 |
| 92 | 9574 | 9400 | 9226 | 905 | 887 | 8704 | 8530 | 8355 | 8181 | 69：800 | 59.749 | 769 | 783 | 8102 | 8306 | 850 | 8712 | 89 | 919 |  | 92 |
| 93 | 7178 | 7002 | 6826 | 6650 | 6474 | 6298 | 6122 | 5946 | 5770 | $70 \cdot 559$ | 60．3987 | 4192 | 4398 | 4604 | 4809 | 5015 | 5220 | 54 | 563 |  | 93 |
| 94 | 4782 | 20 |  | 4249 | 167 | 3893 | 130 | 3537 | 3359 | 71.3181 | 61.0481 | \％189 | 739 | ， | 1312 | 1520 | 1728 | 193 | 2143 |  | 94 |
| 95 | 2386 | 20 | 2027 | 184 | 160 | 1488 | 1308 | 1128 | 948 | 72．0768 | 61.6976 | 718 | 739 | 760 | 7816 | 802 | 823 | 844 | 865 |  | 95 |
| 96 | 999 | 9808 |  | 9445 | 9264 | 9082 | 8900 | 719 | 8537 | 72.8355 | $62 \cdot 347$ | 3682 | 3895 | 410 | 4319 | 4531 | 4743 | 495 | 516 | 537 | 96 |
| 9 | 7594 | ， | 7227 |  | 686 | 6677 | 6493 | 6310 | 6126 | 73.5942 | 62.996 | 17 | 0394 | 0608 | 0822 | 103 | 1251 | 146 | 167 |  |  |
| 9 | 519 | 5013 | 2287 | 4642 | 445 | 4271 | 4086 | 3900 | 3715 | 74.3529 | 63.6459 | 667 | 6892 | 71 | 7326 | 754 | 7759 | 7975 | 8191 | 8408 | 98 |
|  | 2802 | 2615 | 428 | 2241 | 2053 | 1866 | 1679 | 1491 | 1304 | 75.11 | 64．2954 | 317 | 339 | 3610 | 3829 | 4048 | 4266 | 448 | 4704 | 492 | 99 |
| 100 | 04 | 17 | 28 | 9839 | 9650 | 9461 | 9271 | 9082 | 8893 | 75．8703 | 64.9448 | 9669 | 9890 | III | 0332 | 0553 | 0774 | 995 | 1216 | 37 | 0 |
|  | $30^{\prime}$ | 29 | 28 | 27 | 26 | 25 | 24 | $23{ }^{\prime}$ | $22^{\prime}$ | $21^{\prime}$ | $30^{\prime}$ | 29＇ | $28^{\prime}$ | $27^{\prime}$ | $26^{\prime}$ | $25^{\prime}$ | 24 | $23^{\prime}$ | $22^{\prime}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


## TRAVERSE TABLES

| $40^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | SINE． |  |  |  |  |  |  |  |  |  | $40^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $0^{\prime}$ | $51^{\prime}$ | $32^{\prime}$ | $53^{\prime}$ | 54 | $55^{\prime}$ | 56 | 57 | 58 | $59^{\prime}$ | $50^{\prime}$ | 1 | 82＇ | 53 | 54 | $55^{\prime}$ | 56 | 57 | 58 | 59 |  |
|  | 7566 | 7564 | 7562 | 7560 | 75 | 75 | 7555 | 7553 | 7551 | 7549 | 6539 | 6541 | 6543 | 6545 | 654 | 6550 | 6552 | 655 | 6556 | 6558 |  |
| 2 | 5132 | 5128 | 5125 | 51 | 5117 | 5113 | 5109 | 5106 | 5102 | －509 | －3077 | 3082 | 308 |  |  |  | 310 | 310 | 3112 | 17 |  |
|  | 2698 | 2693 | 2687 |  | 2676 | 2670 | 2664 | 2658 | 2653 | 2.26 | ． 9 | 9622 | 962 | 963 | 964 | 9649 | 9655 | 9662 | 9669 | 967 |  |
| 4 | 0265 | 0257 | 0249 | 0242 | 0234 | 0227 | 021 | 021 | 020 | 3.01 |  | 6163 | 617 | 618 | 619 | 619 | 620 | 6216 | 6225 |  |  |
| 5 | 831 | 782 | 7812 | 7802 | 7893 |  | 7774 |  | 7755 | 748 |  | 2704 | 27 | 2726 | 273 | 2748 | 2759 | 2770 | 2781 | 2792 |  |
| 6 | 5397 | 5385 | 5374 |  | 5351 | 5340 |  |  |  | 4.5294 | 3.9232 | 9245 | 9258 | 9271 | 9284 | 9298 | 9311 | 324 | 3337 |  |  |
|  | 2963 | 2950 | 2936 | 2923 | 2910 | 28 |  |  |  |  |  | 5786 | 580 | 5816 | 5832 | 5847 | 5863 |  | 5893 |  |  |
| 8 | 0529 | 0514 | 0499 | 0484 | 0468 | 0453 | 0438 | 仡 | 0407 | 10， |  | 2326 | 23 | 23 | 23 | 23 | 2414 | 2432 | 50 |  |  |
|  |  |  |  |  | 8027 | 8010 |  |  |  | 794 | 5.8 | 8867 | 888 | 89 | 8927 | 894 | 析 | 8986 | 9006 |  |  |
| 10 | 5661 | 5642 | 23 | 5604 | 5585 | 5566 | 5547 | 5528 | 5509 | 7.5490 | 6.5386 | 5408 | 5430 | 5452 | 5474 | 54 | 5518 | 5540 | 5562 | 5584 | 10 |
| 11 | 322 | 32 | 3186 | 3165 | 3144 | 3123 | 3102 | 3081 | 306 | 8.303 | ． 1925 | 194 | 197 | 1997 | 2021 | 2046 | 2070 | 2094 | 2118 | 2142 |  |
| 12 | 079 | 07 | 0748 | 0725 | 070 |  |  |  | 0611 | 9.058 |  |  | 51 | 85 |  | 8595 | 8622 |  | 8674 |  | 2 |
| 13 | 83 | 8335 | 8310 | 8286 | 8261 | 8236 | 821 |  | 8162 | 9.813 |  | 5031 | 5059 | 508 |  | S， | 5173 |  | 52 | 525 | 13 |
| 14 | 5926 | 5899 | 5873 | 5846 | 5819 |  |  |  |  | 10.568 |  | 1 | 602 | 1633 | 16 | 169 | 172 |  | 1787 |  | 14 |
| 15 | 34 |  |  |  |  |  |  |  |  | $11 \cdot 32$ |  | 811 | 8145 | 8178 | 82 |  | 8277 | 8310 | 8343 |  | 15 |
| 16 | 1058 | 1028 | 0997 | 0967 | 0937 | 0906 | 0876 | 0845 | 0815 | 12.0784 | 10.4618 | 4653 | 4688 | 723 | 4759 | 4794 | 4829 | 4864 |  |  | 16 |
| 17 | 8625 | 85 | 85 | 85 | 849 | 84 | 8430 |  |  | 128 |  |  |  |  |  |  |  |  | 1455 |  | 17 |
| 18 | 619 |  | 6122 |  | 60 | 6019 |  | 5951 | 5916 | 13.58 | 11 | 773 | 777 | 78 | 78 | 78 | 7932 | 2 | 8012 |  | 18 |
| 19 | 3757 | 37 | 3685 | 48 | 361 | 3576 | 3540 | 3504 | 346 | 14.34 | 12. | 42 | 43 | 43 | 44 | 44 | 4484 | 4526 | 456 | 461 | 19 |
| 20 | 1323 | 285 | 24 | 20 | 1171 | 118 | 1094 | 1056 | 1 | 15.0980 | 13.0772 | 081 | 086 | 090 | 09 | 09 | 1036 | 1080 | 112 | 116 | 20 |
| 21 | 8889 | 8849 | 8809 | 8769 |  | 868 |  |  | 8569 |  |  |  |  |  |  |  |  |  |  |  | 21 |
| 22 | 64 |  |  | 6330 | 62 | 62 |  | 6162 | 6120 | $16 \cdot 60$ | 14.3849 |  | 3946 |  |  |  | 4140 |  |  |  | 22 |
| 23 | 402 | 3978 | 3934 | 3890 | 38 | 38 | 3759 | 37 | 367 | 17 | 15 | 0439 | 048 | 0540 |  | 06 | 069 | 0742 | 0793 |  | 23 |
| 24 | 15 | 1542 |  |  |  |  |  |  | 1222 | 18.11 |  |  | 7032 |  |  |  | 724 |  | 7349 |  | 24 |
| 25 | 915 | 9106 | 9059 | 11 | 8963 | 8916 | 8868 | 8820 | 8773 | 18.87 | 16 | 35 | 357 | 3630 | 3685 | 37 | 379 | 385 | 3905 | 966 | 25 |
| 26 | 672 | 667 | 6621 | 6571 | 6522 | 6472 | 6423 | 6373 | 6324 | 19.6274 | $17 \cdot 0004$ | 006 | 0118 | 017 | 023 | 029 | 0347 | 0404 | 0461 | 0518 | 26 |
| 27 | 428 | 4 | 4183 | 4132 | 4080 | 4029 |  | 3926 | 3875 | 20 |  | 6602 | 666 | 67 |  |  |  |  | 7017 |  | 27 |
| 28 | 18 |  |  |  |  |  | 1532 |  | 1426 | $21 \cdot 13$ | $18 \cdot 3081$ | 3143 | 32 | 326 |  |  |  | 3512 | 3574 |  | 28 |
| 29 | 94 | 9363 | 9308 | 9253 | 9198 | 9142 | 908 | 9032 | 8976 | 21 |  | 9683 | 974 | 98.1 | 9875 | 9939 | －002 | 0066 | 0130 |  | 29 |
| 30 | 6984 | 692 | 6870 | 6813 | 56 | 6699 | 6642 | 6585 | 6527 | 22.6470 | $19 \cdot 6158$ | 6224 | 6290 | 6356 | 6422 | 6488 | 6554 | 6620 | 6686 | 675 | 30 |
| 31 | 4551 | 4492 | 4433 |  |  |  |  |  |  | 23.4019 | $20^{\prime 2697}$ |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 21 | 2056 |  | 193 |  |  |  |  |  | 24 | 20.92 |  |  | 94 |  | 95 |  |  |  |  | 32 |
| 33 | 9683 | 9620 | 9557 | 949 | 9432 |  | 9306 |  | 9180 | 2 | 21－5774 |  |  | 59 |  | 61 |  | 6282 |  |  | 33 |
| 34 | 72 | 7 | 7120 | 705 |  | 692 | 686 | 6796 | 673 | 5.666 | 22 | 23 |  |  | 26 | 268 | 271 | 283 | 291 |  | 34 |
| 35 | 481 | 4749 | 4682 | 4615 | 454 | 448 | 4415 | 4349 | 4282 | $6^{6} 4215$ | 22 | 89 |  | 9082 | 915 | 923 | 93 | 939 | 946 |  | 35 |
| 36 | 23 | 2313 | 2244 | 2176 | 2107 | 2039 | 1970 | 1901 | 1833 | $27^{\prime \prime} 1764$ | $23 \cdot 5390$ | 5469 | 5548 | 5628 | 5707 | 5786 | ｜ | 5944 | 6023 | 6102 | 36 |
| 37 | 991 | 9877 | 980 | 9736 |  |  |  | 9454 | 9384 | 27．931 |  | 2010 | 209 | 2173 |  | 235 | 2417 | 2498 |  |  |  |
| 38 | 751 | 7441 | 73 | 7297 |  | 71 | 7080 | 7007 | 693 | 28 ＇686 |  | 855 | 86 | 87 | 8802 |  | 8969 | 9052 | 913 |  | 38 |
| 39 | 508 | 5006 | 49 | 485 |  |  |  |  | 448 | 29.44 |  |  | 517 |  |  |  | 5520 |  |  |  | 39 |
| 40 | 26 | 2570 | 2494 | 2418 | 234 | 2265 | 2189 | 2113 | 2036 | 30•1960 | $26^{\prime} 1544$ | 1632 | 1720 | 1808 | 1896 | 1984 | 2072 | 2160 | 24 |  | 40 |
| 41 | 0212 |  | ＋056 | 997 |  | 982 |  |  |  | 30．95 | 26．8083 |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 77 |  | ， | 7538 | 7458 | 7378 |  |  |  | 31.70 |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 53 | 52 | 5181 | 509 | 5017 | 4935 | 4853 | 4771 | 4689 | 32．460 | $28 \cdot 1160$ | 1255 | 1349 | 14 | 1539 | 1633 | 1728 | 1822 | 1917 |  | 43 |
| 44 | 291 | 2827 | 2743 | 265 | 2576 |  |  | 234 | 22 |  |  | 7 | 78 |  |  | 8183 | 8279 | 8376 | 8473 |  | 44 |
| 45 | 047 |  |  | 02 | 013 | －048 |  | 77 |  | 33．9705 | $29 \cdot 423$ |  | 443 | 45 | 4633 | 47 |  | 493 | 50 |  | 45 |
| 46 | 80 |  | 7868 | 7780 | 7693 |  | 7517 | 7430 | 7342 | 34.7254 | 30．0776 | 087 | 0978 |  |  |  |  |  |  |  | 46 |
| 47 |  |  | 5430 | 534 | 5251 | 5162 | 5072 |  | 4893 | 35.4803 | 30.7315 | 7418 | 752 |  | 7728 | 7832 | 7935 | 8038 | 814 | 245 | 47 |
| 48 | 317 | 3084 | 29 | 29 | 2810 |  |  |  | 2444 |  | 31 |  | 406 |  |  | 4381 |  | 4592 | 469 |  | i8 |
| 49 | 07 | 0648 | 05 |  | 0368 |  | 0181 |  |  | 36．9901 | 32．03 | 05 | 06 |  | 08 | 0931 | 1038 | 11 | 12 |  | 49 |
| 50 | 8307 | 8212 | 8117 | 8022 | 7927 | 7832 | 7736 | 7641 | 7546 | $37 \cdot 7450$ | 32．6930 | 704 | 715 | 7260 | 7370 | 480 | 590 | 7700 | 81 | 792 | 50 |
|  | 5874 | 5777 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 34 | 33 | 3242 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 092 |  | 52 |
| 53 |  | 0905 | 0804 | 0703 | 0602 | 0501 | 0400 | 0299 | 019 | 40．009 | 34 | 666 | 6780 | 6896 | 013 | 129 | 7246 | 736 | 747 |  | 53 |
| 54 | 8572 | 8469 | 83 | 826 | 8161 |  |  |  | 77 |  |  | 320 |  |  |  |  |  |  |  |  | 54 |
| 55 | 613 | 6034 | 59 |  | 571 |  | 5510 |  |  | 41.5 | 35.9623 | 97 |  |  | ＋107 | 0228 | 0349 | 0470 | 0591 | 0712 | 55 |
| 56 | 3704 | 3598 | 3491 |  |  |  |  |  |  | 42.27 | $36 \cdot 6162$ |  |  |  |  |  |  |  |  |  | 56 |
|  |  | 1162 |  |  | 0836 | 0728 | 0619 | 0511 | 0402 | 43.029 | $37 \cdot 27$ |  |  |  |  |  | 345 |  |  |  |  |
| 58 | 883 | 8726 | 86 | 85 |  |  | 81 |  |  |  |  |  |  |  | 97 | 矿 |  | 013 | 259 |  | 5 |
| 59 | 618 | 6291 | 6178 |  |  |  |  |  | 504 |  | 38.5778 |  | 603 | 61 | 6297 | 6427 | 655 | 686 | 681 |  | 59 |
| 60 | 3969 | 3855 | 3741 | 3626 | 3512 | 3398 | 3283 | 3169 | 3055 | $45^{\circ}$ | 39．23 | 244 | 25 | 2713 | 2844 | 297 | 310 | 3240 | 337 |  | 60 |
|  | 1535 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 91 | 898 | 88 | 87 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 642 |  |  |  |  |  |  | $47 \cdot 55$ | 41 |  |  |  |  | 262 |  | 945 |  |  | 63 |
| 64 | 4233 | 4112 | 399 | 38 | 3746 |  |  |  | 32 | 48.31 | 41．8471 |  |  |  |  |  |  |  |  |  |  |
| 65 | 180 | 16 | 155 |  |  |  | 1057 |  |  | 49.06 | 40．50 |  |  |  |  |  |  |  |  |  | 65 |
| 66 | 9366 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 667 |  |  |  | 6167 |  | 591 | 50.57 | 43.80 |  |  |  |  |  | 89 |  |  | 9412 | 67 |
| 68 | 449 | 436 | 423 | 111 | 153 | 3851 | 1 | 3592 | 346 | 51 | 44 |  |  |  | 271 |  |  |  |  |  | 68 |
|  |  |  |  |  |  |  |  |  | 10 | 52.088 | $45 \cdot 1$ |  |  |  |  | 192 |  |  |  |  | \％ |
| 70 | 9630 | 9497 | 936 | 923 | 909 | 8964 | 8831 | 8697 | 8564 | 52＇8430 | 57 | 785 | 80 | 8165 | 8319 | 847 | 8626 | 87 |  | 908 | 70 |
| 7 | 71 | 70 | 69 | 6791 | 6656 |  |  |  | 6115 |  | 46.42 |  |  |  |  |  |  |  |  |  |  |
| 72 | 476 | 462 |  |  |  |  |  |  |  | 35 |  |  |  | 2500 | 析 | 157 |  |  |  |  |  |
|  | 23 | 21 | 205 | 1912 | 1773 | 163 | 149 | 1356 | 1217 | 55.107 | $47 \cdot 73$ | 747 | 76 | 780 | 7961 | 8121 | 838 | 84 | 86 | 87 | 73 |
| 74 | 9895 | 975 | 9613 | 472 | 析 | ， |  |  |  | 867 | 48.38 | 4020 | 18 | 4345 | 4508 | 4671 |  |  |  |  | 74 |
| 75 | 7461 | 731 |  |  |  |  |  |  |  | $56^{\circ}$ | 49.03 |  | 072 | 089 | 105 | 122 | 138 | 1550 | 171 | 188 | 75 |
| 76 | 50 | 4883 |  |  |  |  |  |  |  |  | 49.69 | 7102 | 726 |  |  |  |  |  | 2 |  | 76 |
| 77 | 2593 | 2447 | 230 | 2154 | 20 | 1861 | 17 | 1567 | 14 | 58．1273 | $50 \cdot 34$ | 361 | 3812 | 3981 | 415 | 432 | 448 | 465 | 482 | 495 |  |
| 78 | 0160 | ， | 9863 | 91275 |  | 析 | －268 | 9120 | 砣 | ． | 00 | ， |  | 0526 | \％ | 7419 | 704 | 77 | 7883 |  |  |
| 79 | 7726 | 7575 | 7425 | 7275 | 7124 | 6974 | 6823 | 6673 | 6522 | $59 \cdot 6371$ | 51.6550 | 6724 | 689 | 7072 | 724 | 741 | 759 | 77 | 79 | 8113 | 79 |
| 80 | 5292 | 5140 | 4987 | 4835 | 4683 | 4530 | 4378 | 25 | 4073 | 60．3920 | 52．308 | 326 | 34， | 3617 | 3793 | 析 | 472 | 4320 | 449 |  | 80 |
| 81 | 28 | 2704 | 2550 |  | ${ }^{2241}$ | 2087 |  |  | 1624 |  |  | ¢3 |  |  |  | 0518 |  |  |  |  |  |
|  | － | 0268 | ， |  |  |  | 9487 | 9331 | ， 72 | 61.90 | 53 | 634 | 6527 | 670 | 68s |  | 721 |  | d |  |  |
|  | 799 | 783 | 7674 | 7516 | 358 | 720 | 7042 | 688 | 6726 | 62＇656 | 54．270 | 28 | 30 | 3252 | 343 | 361 | 380 | 398 | 416 | 438 | 83 |
| 8 | 5556 | 539 | 523 | 507 | 表 | 5 | 4597 |  | 427 |  | 54．923 | 9428 | 6613 | 左 | 953 | ， 617 | 0352 | 05 | 721 |  |  |
| 85 | 析 | 2961 | 2799 | 2637 | 2475 | 2314 | 2152 | 1990 | 1827 | 64．1665 | 55.578 | 596 | 615 | 6343 | 653 | 671 | 6903 | 7090 | 727 |  | 85 |
| 86 | 0689 | O52 | 析 | 10198 | 34 | 9870 | 9706 | 9542 | 937 | 64 | 56.23 | 2510 | 269 | 2888 | 3077 | 326 |  | 3644 | 383 | 402 | ${ }^{6}$ |
|  | 825 | 808 | 7924 | 7758 | 7593 | 7427 | 7261 | 7095 | 6929 | $65 \cdot 67$ |  | 9050 | 9242 | 9433 | 962 | 9816 | 607 | 1985 |  |  |  |
|  | 5821 | S65 |  |  | 5151 |  | － | 20 | 48 | 66 | 57：539 | 5101 | 53 | 598 | 617 | det |  | 6752 | 695 |  |  |
| 89 | 3387 | 3218 | 3049 | 2879 | 2710 | 2540 | 23 | 22 | 203 | 67－1861 | $58 \cdot 193$ | 21 | 23 | 252 | 271 | 291 | 311 | 330 | 350 | 369 | 89 |
| 90 | 095 | 0782 | 0611 | 0420 | 0268 | 1097 | 9925 | 9754 | 9582 | $67 \cdot 9410$ | 58.847 | 8673 | 8871 | 9069 | 926 | 9465 | 9662 | 986 | ${ }^{0}$ | 025 |  |
|  | 85 |  |  |  |  |  |  |  | 矿 |  |  |  |  | 保 | 5 | 601 | 27 |  | 6614 | 仡 |  |
|  | 6086 | 591 | 5736 | 5560 | 5385 | 5210 | 5035 | 4859 | 4684 | 69.450 | 60．1552 | 1755 | 1957 | 2159 | 236 | 256 | 2766 | 29 | 317 | 337 |  |
|  | 3652 | 3475 | 3298 | 3121 | 2944 | 2767 | 2589 | 2412 | 2235 | 70．205 | 60．8091 | 829 | 8500 | 8704 | 8909 | 911 | 9318 | 568 | 9170 | 931 |  |
|  | 218 | 1039 | 0860 | 0681 | 0502 | 0323 | 1144 | 9965 |  |  | 61／4629 | 4836 | 5043 | 5250 | 5456 | 566 | 587 | 607 | 628 | 648 |  |
|  | 8784 | 8603 | 8423 | 8242 | 8061 | 7880 |  | 18 | 7337 | $71 \cdot 715$ | 62．1168 | 1377 | 586 | 795 | 2004 | 2213 | 2421 | 2630 | 283 | 304 | 95 |
|  | 6350 | 6168 |  |  | 5619 | 5436 | 5254 | 5071 | 4887 | 72＇4704 | 62.7706 | 7918 | 8129 |  | 8551 | 8762 |  |  |  |  | 96 |
|  | 3916 | 3732 | 3547 | 363 | 3178 | 2993 | 280 | 2623 | 438 | ． 2253 | 63.4245 | 4459 | 4672 | 4885 | S099 | 5312 | 552 | ） | 5951 |  | 97 |
|  | 483 | 12 | 10 | 0923 | 0736 | 0550 | 0363 | －176 | 9989 | 73.980 | 64．078 | 095 | 1215 | 1430 | 1646 | 1861 | 207 | 2292 | 250 | 272 | 98 |
|  | 904 | 8860 | 8672 | 683 | 8295 | 06 | 7918 | 7729 | 7540 | 74.735 | 64.7322 | 7540 | 7758 | 7976 | 8173 | 8411 | 8629 | 884 | 5620 |  | 99 |
| 0 | 6615 | 42 | 6234 | 6044 | 54 | 5663 | 672 | 282 | 091 | 5.49 | 3861 | 4081 | 6301 | 4521 | 4741 | 4961 | 5180 | 400 | 5620 | 120 | 100 |
|  | $10^{\prime}$ | ［ $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ | $1^{\prime}$ |  |  |  |  | $6^{\prime}$ | $5{ }^{\prime}$ | $4^{\prime}$ | ， | 2 | 1 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| 41 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $41^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11^{\prime}$ | $12{ }^{\prime}$ | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | 16 | 17 | 18 | $19^{\prime}$ | $10^{\prime}$ | $11^{\prime}$ | 12 | 13 | $14^{\prime}$ | $15^{\prime}$ | 16 | 17 | 18 | 18 |  |
|  | 7528 | 75 | 75 | 7522 | 7520 | 7518 | 7516 | 7515 | 75 | 7511 | 6583 | 585 | 658 | 6589 | 65 | 593 | 6596 | 6598 | 6600 |  |  |
|  | 5056 | 50 | 504 | 5044 | 5041 | 503 | 5033 | 50 | 502 | 1.502 | 31 | 31 | 317 | 317 | 3183 | 3187 | 6191 3181 | 3196 | 3200 | 32 |  |
|  | 258 | 2578 | 2572 | 2567 | 2561 | 2555 | 2549 | 25 | 2538 | 2.253 | 1974 | 975 | 97 | 97 | 9774 | 9780 | 9787 | 97 | 9800 |  |  |
|  | 0112 | 0104 | 0097 | 0089 | 008 | 0074 | 0066 | － | 005 | 3.00 |  | 633 | 634 | 6356 | 6365 | 6374 | 6383 | 6391 | 640 | 6409 |  |
|  | 7640 |  | 76 | 761 | 7602 | 7592 | 7582 | 75 | 75 | $3 \cdot 75$ | 3.2 | 29 | 2934 | 2945 | 295 | 2967 | 2978 | 298 | 3000 | 30 |  |
|  | 5168 | 5156 | 5145 | 5133 | 5122 | 5110 | 5099 | 5087 | 5076 | 4.5064 | 3.9495 | 9508 | 9521 | 9534 | 9548 | 9561 | 9574 | 9587 | 9600 | 9613 |  |
|  | 269 | 268 | 266 | 265 | 264 | 262 | 26 | 26 | 25 | 5.25 | 4.60 | 60 | 610 | 61 | 6139 | 6154 | 6170 | 618 | 6200 | 62 |  |
|  | 0224 | 0209 | 0193 | 0178 | 0163 | 0147 | 0132 | 0116 | 0101 | 6.00 | 5.2660 | 267 | 269 | 2713 | 2730 | 2748 | 2765 | 2783 | 280 | 28 |  |
|  | 7752 | 773 | 771 | 7700 | 7683 | 766 | 7648 | 7631 | 761 | 6.75 | 5.92 | 92 | 92 | 93 | 9321 | 9341 | 9361 | 938 | 9400 | 942 |  |
| 10 | 5280 | 5261 | 5241 | 5222 | 5203 | 5184 | 5165 | 5146 | 5126 | $7 \cdot 5107$ | 6.5825 | 5847 | 5869 | 5891 | 5913 | 5935 | 5956 | 5978 | 6000 | 6022 | 10 |
| 11 | 280 | 278 | 2766 | 27 | 2723 | 2702 | 2681 | 2660 | 26 | 8.2618 | 08 | 24 | 245 | 248 | 2504 | 2528 | 2552 | 2576 | 260 | 2624 | 11 |
| 12 | 0336 | 0313 | 02 | 026 | 02 | 0221 | 0198 | 0175 | 0152 | ． 012 | － | 9016 | 904 | 90 | 90 | 9121 | 9148 | 917 | 92 | 922 | 12 |
| 13 | 7864 | 7839 | 78 | 778 | 7764 | 7739 | 16 | 7689 | 7664 | 9.7 | 8.55 | 560 | 56 | 56 | 56 | 5715 | 574 | 577 | 58 | 58 | 13 |
| 14 | 5392 | 5365 | 53 | 53 |  | 52 | ， | 5204 | 5177 | 10.515 | 215 | 2186 | 221 | 22 | 2278 | 2308 | 233 | 2370 | 240 | 2431 | 14 |
| 15 | 2920 | 2891 | 2862 | 2833 |  | 2776 | 47 | 18 | 269 | 11.266 | 9.8738 | 877 | 88 | 88 |  | 8902 | 893 | 896 |  | 90 | 15 |
| 16 | 044 | 0417 | 0386 | 0356 | 0325 | 0294 | 0264 | 0233 | 0202 | 12.0172 | 10.5320 | 5355 | 5390 | 5425 | 5460 | 5495 | 0 | 5565 | 5600 |  | 16 |
| 17 | 7976 | 7943 | 791 | 78 | 78 | 7831 |  | 77 | 77 | $12 \cdot 76$ | 11. | 19 | 19 | 2014 | 20 |  | 21 | 21 | 2200 | 2237 | 17 |
| 18 | 5504 | 5469 | 54 | 54 |  | 5331 | 5297 | 5262 | 522 | 13.5193 | 11.848 | 85 | 85 | 86 | 86 | 8682 | 8722 | 876 | 880 | 88 | 18 |
| 19 | 3032 | 2995 | 29 | 2922 |  | 2850 | 2813 | 2777 | 2740 | 14.27 | 12.5 | 51 | 51 | 51 | 5 | 5276 | 5317 | 535 | 5400 | 54 | 19 |
| 20 | 0560 | 0521 | 04 | 0445 | 0406 | 368 | 0330 | 0291 | 0253 | 15.0214 | 13．1650 | 1694 | 1738 | 178 | 182 | 1869 | 1913 | 195 | 2000 | 2044 | 20 |
| 21 | 80 |  |  |  |  |  |  |  |  | 15 | 13 | 82 | 83 | 83 |  |  | 8509 | 85 | 8600 | 864 | 21 |
| 22 | 5616 | 557 | 55 | 54 |  | 5405 | 5363 |  | 52 | 16 | 14 | 48 |  |  |  |  | 51 | 515 | 520 | 52 | 22 |
| 23 | 3144 | 3099 | 3055 | 3011 | 296 | 2923 | 28 | 28 | 279 | $17 \cdot 27$ | 15.1 | 14 | 14 | 15 | 15 | 1650 | 170 | 175 | 180 | 18 | 23 |
| 24 | 0672 | 062 | 058 | 053 | 048 | 0442 | 0396 | 0349 | 0303 | 18.025 | 15.7980 | 8033 | 808 | 813 | 8191 | 8243 | 8295 | 834 | 840 | 84 | 24 |
| 25 | 8200 | 8152 | 810 | 805 | 8008 | 7960 | 7912 | 7864 | 16 | 18 | 16.4563 | 4618 | 665 | 472 | 4782 | 4836 | 489 | 49 | 500 | 505 | 25 |
| 26 | 572 | 567 | 5628 | 5578 | 5528 | 5478 | 5428 | 5379 | 5329 | 19 | $17 \cdot 1$ | 12 | 1259 | 1316 | 1373 | 1430 | 1487 | 1544 | 1600 |  | 26 |
| 27 | 3255 | 32 | 3152 | 3100 | 3049 | 2997 | 2945 | 2893 | 284 | 20 | 17. | 77 | 78 |  |  | 8023 | 8082 | 814 | 820 | 825 | 27 |
| 28 | 0783 | 0730 | 067 | 06 | 05 | 0515 | 0461 | 408 | 035 | 21.03 | 18.4 | 43 | 443 | 449 | 45 | 4617 | 467 | 473 | 4800 | 486 | 28 |
| 29 | 8311 | 8256 | 8200 | 8145 | 808 | 8034 | 7978 | 7922 | 786 | 21 | 19 | 095 | 102 | 108 | 11 | 1210 | 1274 | 1337 | 1400 | 146 | 29 |
| 30 | 5839 | 5782 | 5724 | 5667 | 5609 | 52 | 5494 | 5437 | 5379 | 22.5322 | 19.7475 | 754 | 760 | 767 | 773 | 7804 | 786 | 793 | 80 | 8066 | 30 |
| 31 | 3367 | O8 | 3249 | 3189 |  |  |  |  |  |  | 20＇40 |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 089 | 0834 | 07 | 0711 |  |  | 0527 | 04 | 04 | ， | 21.06 |  |  |  |  |  | ， | 1131 |  |  | 32 |
| 33 | 84 | 83 | 82 | 8234 | 8170 | 8107 | 8044 | 7981 | 79 | 24.785 | $21 \cdot 72$ | 72 | 73 | 74 | 75 | 75 | 765 | 772 | 780 | 787 | 33 |
| 34 | 5951 | 5886 | 582 | 575 | 569 | 5626 |  | 5495 | 5430 | 25536 | 2238 | 38 | 395 | 40 | 41 | 4178 | 425 | 432 | 440 | 44 | 34 |
| 35 | 3479 | 3412 | 3345 | 3278 | 3211 | 3144 | 77 | 3010 | 2942 | 26．287 | 23.0388 | 046 | 054 | 061 | 0694 | 0771 | 084 | 0924 | 1001 | 1077 | 35 |
| 36 | 10 | 0938 | 0869 | 0800 | 0731 | 0662 | 0593 | 0524 | 0455 | 27．0386 | $23 \cdot 6971$ | 70 | 7128 | 7207 | 72 | 7364 | 7443 | 75 | 76 | 767 | 36 |
|  | 85 | 8464 |  | 8323 | 8252 |  | 8110 | 803 | 7968 | 27 | 24．35 | 363 | 37 |  | 38 | 3958 | 403 | 412 | 42 | 428 | 37 |
| 38 | 6063 | 599 | 59 | 5845 | 57 |  | 5626 | 55 | 5488 | $28 \cdot 54$ | 25.0 | 021 | 03 |  | 04 | 055 | 063 | 0718 | 0801 |  |  |
| 39 | 3591 | 35 | 34 | 336 | 32 | 3218 | 3143 | 30 | 29 | 29.29 | $25 \cdot$ | 680 | 68 | 6974 | 70 | 714 | 723 | 7315 | 740 | 748 | 39 |
| 40 | 11 | 1043 | 0966 | 0889 | 3 | 0736 | 0659 | 82 | 0506 | 30.042 | 26.33 | 3388 | 3476 | 3563 | 36 | 373 | 38 | 39 | 400 | 40 | 40 |
| 41 | 8647 | 569 | 8490 |  | 8333 | 8254 | 8176 | 8097 | 8018 | $30 \cdot 794$ | 26 | 9973 |  |  |  |  | 0421 | 0511 |  |  | 41 |
| 42 | 617 | 6095 | 60 |  | 5853 | 5773 |  | 56 | 5531 | 31.54 | 27.6 | 655 | 665 |  | 68 | 6925 | 7017 | \％ | 720 |  | 42 |
| 43 | 3703 | 3621 | 353 | 34 | 337 | 3291 | 3209 | 3126 | 3044 | 32．29 | 28.30 | 314 | 323 | 333 | 342 | 351 | 3613 | 370 | 380 | 389 | 43 |
| 44 | 1231 | 1147 | 106 | 09 | 089 | 081 | 0725 | 0641 | 0556 | 33.047 | 28.96 | 972 | 98 | 992 | ＋016 | 0112 | 0208 | 030 | 0401 |  | 44 |
| 45 | 8759 | 8673 | 8587 |  | 8414 | 8328 | 242 | 8155 | 8069 | 33＇79 | 29：6213 | 631 | 64 | 65 | 6607 | 6706 | 680 | 690 | 7001 |  | 45 |
| 46 | 6287 | 6199 | 6111 | 6023 | 5935 | 5846 | 5758 | 5670 | 5581 | 34：5493 | 30．2796 | 2896 |  | 3098 | 3198 | 3299 | 3400 | 3500 |  |  | 46 |
| 47 | 3815 | 3725 | 3635 |  |  | 3365 | 275 | 84 | 309 | 35 | 30 | 94 |  |  | 97 | 9893 | 999 | 1098 | 020 |  | 47 |
| 48 | 1343 | 125 | 11 |  | 0975 | 08 | 0791 | 069 | 060 | 36 | 31.59 | 606 | 61 | 62 |  | 648 | 659 | 668 | 680 | 69 | 48 |
| 49 | 8871 | 8777 | 86 |  |  | 8402 | 8308 | 8213 | 81 | 36 | 32.25 | 265 | 27 |  | 297 | 3079 | 3187 | 328 | 340 | 35 | 49 |
| 50 | 6399 | 6303 | 6207 | 6112 | 6016 | 5920 | 5824 | 5728 | 5632 | 37 | 32 | 9235 | 9345 | 9454 | 9564 | 967 | 978 | 9892 | －0 | 0110 | 50 |
| 51 | 3927 | 3829 | 37 | 36 | 35 | 3438 | 340 | 3243 |  | 38.30 | 33 | 582 |  |  |  | 6266 | 6378 | 64 |  |  | 51 |
| 5 | 145 | 135 | 1 |  |  |  |  | 0757 | 06 |  | 34 | 240 | 25 | 26 |  |  | 2974 | 30 | 320 | 33 | 52 |
| 53 | 8983 | 8881 | 8780 | 8678 | 857 | 8475 | 73 | 8272 | 8170 | $39 \cdot 80$ | $34 \cdot 887$ | 8989 | 910 |  | 933 | 94 | 956 | 968 | 980 |  | 3 |
| 54 | 6511 | 6408 | 63 |  |  |  |  | 5786 | 5683 | $40 \cdot 55$ |  | 55 | 56 |  | 59 | 6047 | 61 | 628 | 640 | 651 | 54 |
| 55 | 4039 | 3934 | 38 | 37 | 361 | 3512 |  | 3301 | 3195 | $41 \cdot 3090$ | 36.2038 | 215 | 2279 | 24 | 2520 | 2640 |  | 28 | 300 | 312 | 55 |
| 56 | 1567 | 1460 | 1352 | 1245 |  |  | 0923 |  | 0708 | 42.060 | 36 |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 9095 | 8986 | 8876 | 876 | 8658 | 8549 | 8439 | 8330 | 8221 | 42.8111 | 37 | 53 |  |  | 5702 | 5827 | 5952 | 6076 | 6201 |  |  |
| 58 | 6623 | 65 |  |  |  | 6067 |  | 5845 | 5733 | 43.5622 | 38.178 | 1913 | 2040 | 21 | 22 | 24 | 25 | 267 | 280 | 292 | 58 |
| 59 | 4151 | 40 |  |  |  |  | 3472 | 3359 | 3246 | $44 \cdot 3133$ | 38．836 | 8498 | 8627 |  | 888 | 9014 | 914 | 927 | 940 |  | 59 |
| 60 | 1679 | 1564 | 1449 | 133 | 1219 |  | 0989 | 0874 | 0758 | 45.0643 | 39－4951 | 5082 | 5214 | 534 | 5476 | 5607 | 57 | 5870 | 6001 | 6132 | 60 |
| 61 | 920 | 9090 |  |  |  |  |  | 838 | 827 | $45 \cdot 815$ | 40＇153 |  |  |  |  | 22 | 23 |  |  |  |  |
| 62 | 673 | 661 | 64 |  |  |  | 6022 | 5903 |  | $46 \cdot 56$ | 40.81 | 82 | 83 |  |  |  |  |  | 硅 |  | 62 |
| 63 | 4263 | 41 | 40 | 39 |  | 3659 | 3538 | 3417 |  | 47317 | $41^{1469}$ |  |  |  | 5250 | 538 | 552 |  | 58 |  |  |
| 64 | 1791 | 1668 | 1546 | 1423 |  |  | 1055 | 0932 | 080 | 48.068 | 42.1281 | 142 | 15 | 17 | 18 | 198 | 212 | 22 | 240 | 254 | 64 |
| 65 | 9319 | 9194 | 9070 |  |  | 86 |  |  | 8322 | 48.8197 | 42.7864 | 8006 | 8148 | 201 | 8433 | 8575 | 8717 | 8859 | 900 | 91 | 65 |
| 66 | 684 | 6720 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 501 |  | 66 |
| 67 | 4375 | 4246 | 4118 | 39 | 3861 | 3733 | 3604 | 347 | 334 | $50 \cdot 3$ |  | 11 |  |  |  | 835 | ， | 205 | 220 |  | 67 |
| 68 | 1903 | 1772 |  | 151 |  | 1251 | 1121 | 0990 | 0860 | 51.0729 | $44 \cdot 761$ | 776 |  | 80 | 82 | 83 | 8504 | 865 | 880 | 89 | 68 |
| 69 | 9431 | 9298 |  |  | 890 | 8769 | 8637 | 8505 | 8372 | 51.021 | $45 \cdot 419$ | 434 | 研 | 464 | 479 |  | 516 | 525 | 541 | － | 69 |
| 70 | 6959 | 682 | 6690 | 655 | 64 | 628 | 6154 | 6019 | 588 | 52．575 | 46.077 | 0929 | 108 | 123 | 138 | 15 | 1695 | 1848 | 200 | 215 | 70 |
| 71 | 4487 | 4351 | 42 | 40 | 3942 | 3806 | 87 | 3534 | 3398 | 53．326 | 46.735 | 7514 | 767 | 782 | 79 | 813 | 8291 | 844 | 860 |  | 71 |
|  | 2015 | 1877 |  |  |  | 1325 | 1， | 1048 | 0910 | 54.077 | 47394 | 409 | 425 | 44 | 457 | 472 | 4886 | 504 | 520 | 53 | 72 |
| 73 | 9543 | 9403 | 9263 | 9123 | 898 | 8843 | 8703 | 8563 | 8423 | 54：8283 | 48.0524 | 0684 | 0843 | 100 | 1163 | 1322 | 1482 | 164 | 1801 |  | 72 |
| 74 | 7071 | 6929 | 6787 | 66 |  | 6361 | 6220 | 6078 | 5935 | 55．5793 | 48.7106 | 726 | 743 | 759 | 7754 | 79 | 8078 | 823 | 840 | 85 | 75 |
| 75 | 4599 | 4455 | 4311 | 41 | 4024 | 3880 | 3736 | 3592 | 3448 | 56.330 | 49．368 | 385 | 401 | 48 |  | 45 | 1673 | 483 | 500 | 51 | 75 |
| 76 | 2126 | 1981 | 1835 | － | 154 | 13 | 12 | ， | 0961 | 57.08 |  |  |  |  |  |  |  |  |  |  |  |
| 77 | 9654 | 9507 | 93 | 921 | 906 | 8917 | 8769 | 8621 | 8473 | $57 \cdot 8326$ | 50.685 | 7022 | 719 | 735 | 7528 | 769 | 7865 | 803 | 820 | 837 | 77 |
| 78 | 782 | 7033 |  | 6734 | 658 | 6435 | 6285 | 6136 | 5986 | 58.5836 | 51.343 | 3607 | 3778 | 3948 | 4119 | 4290 | 4460 | 463 | 480 | 497 | 78 |
| 79 | 4710 | 4559 | 4408 | 4256 | 4105 | 3953 | 3802 | 3650 | 3499 | 59.3347 | 52.0019 | 0192 | 0365 | 0538 | 0710 | 088 | 1056 | 122 | 140 |  | 70 |
| 80 | 2238 | 2085 | 1932 | 177 | 162 | 1472 | 1318 | 1165 | 101 | 60.0858 | 52.660 | 6776 | 695 | 7127 | 730 | 747 | 765 | 782 | 800 | 817 | 80 |
| 81 | 9766 | 9611 | 9456 | 9301 | 91 | 89 | 88 | 8679 | ${ }^{8524}$ | 60＇8368 | 53.318 | 336 | 3538 | 371 | 389 | 407 | 4247 | 442 | 460 | 478 | 81 |
| 82 | 729 | 7137 | 6， | 682 | 666 | 650 | 6351 | 6194 | 6037 | 61.5879 | 53 | 9946 | －125 | O30 | 048 | 76 | 0843 | 1022 | 1201 | 待 | 82 |
| 83 | 4822 | 4663 | 4504 | 434 | 4186 | 4027 | 3868 | 3709 | 3549 | 62．3390 | 54．634 | 653 | 6712 | 6894 | 7075 | 725 | 7439 | 762 | 780 | 798 | 83 |
| 84 | 2350 | 2189 | 2029 | ， 6 | 1702 | 1545 | 1384 | 1223 | 1062 | 63＊0901 | 55.293 | 3115 | 329 | 348 | 3667 | 3850 | 403 | 421 | 440 | 458 | 84 |
| 85 | 9878 | 9716 | 9553 | 9390 | 9227 | 9064 | 8901 | 8738 | 8574 | 63.841 | 55.951 | 970 | 988 |  | 0258 | － | 4038 | 4 | 401 | 118 | 85 |
| 86 | 7406 | 7242 | 7077 | 6912 | 6747 | 6582 | 6417 | 6252 | 6087 | 64：5922 | 56.609 | 628 | 6473 | 66 | 68 | 3037 | \％ | 741 | 析 |  | 86 |
| 87 | 4934 | 4768 | 4601 | 4434 | 4267 | 4101 | 3934 | 3767 | 3600 | 65＇3433 | 57／2679 | 2869 | 3060 | 325 | 34 | 363 | 382 | 401 | 420 | 439 | 87 |
| 88 | 2462 | 229 | 2125 | 917 | 1788 | 137 | 159 | 1281 | 1122 | $66^{\prime} 0943$ | 57.926 | 9454 | 964 | 983 | －032 | 0224 | 0417 | 0609 | 080 | 099 | 88 |
| 89 | 9990 | 982 | 9649 | 947 | 9308 | 9137 | 8967 | 8796 | 8625 | 66．8454 | 58.584 | 6039 | 6234 | 6428 | 6623 | 6818 | 7012 | 7207 | 7402 | 7596 | 89 |
| 90 | 7518 | 7346 | 7173 | 7001 | 6828 | 6656 | 6483 | 6310 | 6138 | 67－5965 | 59.2426 | 2624 | 2821 | 301 | 3214 | 341 | 360 | 3805 | 400 | 419 | 90 |
| 91 | 5046 | 482 | 468 | 25 | 4 | 4174 | 4000 | 3825 | 3650 | 68 | 59.900 | 9208 | 940 |  | 9806 | ＋005 | 0204 | 2030 | 60 | 080 | 91 |
| 92 | 2574 | 2398 | 2222 | 2045 | 1869 | r693 | 1516 | 1340 | 1163 | 69．0986 | 60.5591 | 5793 | 599 | 617 | 6397 | 6598 | 6799 | 7300 | 7202 | 740 | 92 |
| 93 | －102 | 9924 | 9746 | 9568 | 9389 | 9211 | 9033 | 8854 | 8676 | 69•849 | $61 \cdot 2174$ | 2378 | 258 | 278 | 2988 | 3192 | 3395 | 3598 | 3802 | 400 | 93 |
| 94 | 7630 | 74 | 7270 | 7090 | 6910 | 6729 | 6549 | 6369 | 6188 | 70．6008 | $61 \cdot 875$ | 8962 | 9168 | 937 | 9579 | 978 | 9991 | ＋196 | 0402 | 060 | 94 |
| 95 | 5158 | 49 | 4794 | 4612 | 4430 | 4248 | 4066 | 3883 | 3701 | $71 \cdot 3518$ | 62.5339 | 5547 | 5755 | 5963 | 6171 | 6379 | 6586 | 6794 | 002 | 720 | 95 |
| 96 | 2686 | 2502 | 2318 | 21 | 1950 | 1766 | 82 | 1398 | 1214 | $7{ }^{721029}$ | $63^{\prime} 1922$ | 2132 | 2342 | 2552 | 2762 | 2972 | 3182 | 3392 | 3602 | 381 | 96 |
| 97 | 0214 | ＋028 | 7842 | 9657 | 947 | 9285 | 9099 | 8912 | 8726 | $72 \cdot 8540$ | $63 \cdot 8504$ | 8716 | 8929 | 9141 | 9353 | 9565 | 9778 | 9990 | ＊20 | 041 | 97 |
| 98 | 7742 | 7554 | 7367 | 7179 | 699 | 6803 | 6615 | 6427 | 6239 | 73.6051 | 64.508 | 5301 | 5516 | 57 | 5945 | 6159 | 6373 | 6587 | 6802 | 7016 | 98 |
| 99 | 5270 | 5080 | 4891 | 4701 | 4511 | 4321 | 4132 | 3942 | 3751 | 74.3561 | 65.1669 | 1886 | 2103 | 2319 | 2536 | 2752 | 2969 | 3185 | 3402 | 3618 | 99 |
| 100 | 2798 | 607 | 2415 | 2223 | 2032 | 1840 | 1648 | 456 | 264 | 75－1072 | 65.8252 | 8471 | 8690 | 8908 | 9127 | 3346 | 9565 | 9783 | 1002 | 0220 | 100 |
|  | $50^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | $46^{\prime}$ | 45 | $44^{\prime}$ | 43 | 42＇ | $41^{\prime}$ | $50^{\prime}$ | $0^{\prime}$ | $48^{\prime}$ | 47 | 46 | $45^{\prime}$ | $44^{\prime}$ | $43^{\prime}$ | $42^{\prime}$ |  |  |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Sine |  |  |  |  | $8^{\circ}$ |

TRAVERSE TABLES.

| 41 | Cosine. |  |  |  |  |  |  |  |  |  | Sine. |  |  |  |  |  |  |  |  |  | $41^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 20 | $21^{\prime}$ | $22^{\prime}$ | $23^{\prime}$ | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 | $28^{\prime}$ | $29^{\prime}$ | $20^{\prime}$ | $21^{\prime}$ | $22^{\prime}$ | 23 | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 | $28^{\prime}$ | $29^{\prime}$ |  |
| 1 | 7509 | 7507 | 7505 | 7503 | 7501 | 7499 | 7497 | 7495 | 7493 | 749 | 6604 | 6607 | 6609 | 6611 | 6613 | 6615 | 6617 | 6620 | 6622 | 6624 |  |
| 2 | 5018 | 5014 | 5010 | 5006 | 5002 | 4998 | 4995 | 4991 | 4987 | $1 \cdot 4983$ | $1 \cdot 3209$ | $32 / 3$ | 3218 | 3222 | 3226 | 3231 | 3235 | 3239 | 3244 | 3248 |  |
| 3 | 2526 | 2521 | 2515 | 2509 | 2503 | 2498 | 2492 | 2486 | 2480 | $2 \cdot 2474$ | 1.9813 | 9820 | 9826 | 9833 | 9839 | 9846 | 9852 | 9859 | 9866 | 9872 |  |
| 4 | 0035 | 0028 | O020 | 0012 | +004 | 9997 | 9989 | 9981 | 9974 | 2.9966 | 2.6418 | 6426 | 6435 | 6444 | 6452 | 6461 | 6470 | 6479 | 6487 | 6496 |  |
| 5 | 7544 | 7534 | 7525 | 7515 | 7506 | 7496 | 7486 | 7477 | 7467 | 3.7457 | 3.3022 | 3033 | 3044 | 3055 | 3066 | 3077 | 3087 | 3098 | 3109 | 312 |  |
| 6 | 5053 | 5041 | 5030 | 5018 | 5007 | 4995 | 4984 | 4972 | 4960 | 4.4949 | 9626 | 9639 | 53 | 9666 | 96 | 92 | 05 | 18 | 31 | 9744 | 6 |
| 7 | 2562 | 2548 | 2535 | 2521 | 2508 | 2494 | 2481 | 2467 | 2454 | $5 \cdot 2440$ | 4.6231 | 6246 | 6261 | 6277 | 6292 | 6307 | 6322 | 6338 | 6353 | 6368 |  |
| 8 | 0070 | 0055 | 0040 | 0026 | +009 | 9993 | 9978 | 9963 | 9947 | 5.9932 | 5.2835 | 2853 | 2870 | 2887 | 2905 | 2922 | 2940 | 2957 | 2975 | 2992 |  |
|  | 7579 | 7562 | 7545 | 7527 | 7510 | 7493 | 7475 | 7458 | 7441 | $6 \cdot 7423$ | 5.9439 | 9459 | 9479 | 9498 | 9518 | 9538 | 9557 | 9577 | 9597 | 9616 |  |
| 10 | 5088 | 69 | 5050 | 5030 | 5011 | 4992 | 4973 | 4953 | 4934 | 744915 | 6.6044 | 6066 | 6088 | 6109 | 6131 | 6153 | 6175 | 6197 | 6218 | 6240 | 10 |
| 11 | 2597 | 25 | 25 | 2533 | 25 | 249 | 470 | 2449 | 2428 | 8.240 | $7 \cdot 2648$ | 2672 | 2696 | 2720 | 12744 | 2768 | 2792 | 2816 | 寿 | 2864 |  |
| 12 | 0106 | 0083 | 0059 | 0036 | -013 | 9990 | 9967 | 9944 | 9921 | 8.9898 | 7.9253 | 9279 | 9305 | 9331 | 9357 | 9384 | 9410 | 9436 | 62 | 9488 | 12 |
| 13 | 7614 | 7589 | 7564 | 7539 | 7514 | 7489 | 7464 | 7439 | 7414 | 97389 | 8.5857 | 5885 | 5914 | 5942 | 5971 | 5999 | 6027 | 6056 | 6084 | 6112 | 13 |
| 14 | 5123 | 5096 | 5069 | 5042 | 5016 | 4989 | 4962 | 4935 | 4908 | 10.4881 | 9.2461 | 2492 | 2523 | 2553 | 2584 | 2614 | 2645 | 267 | 2706 | 2736 | 14 |
| 15 | 2632 | 03 | 2574 | 46 | 17 | 2488 | 2459 | 2430 | 2401 | 11.2372 | 9.9066 | 909 | 9131 | 9164 | 9197 | 9230 | 9262 | 9295 | 932 | 9360 | 15 |
| 16 | 0141 | 110 | 0079 | 0049 | 10 | 9987 | 9956 | 9925 | 9895 | 64 | 5670 | 5705 | 5740 | 57 | 10 | 5845 | 880 | 5915 | 5949 | 5984 | 16 |
| 17 | 7650 | 7617 | 7584 | 7552 | 7519 | 7486 | 7453 | 7421 | 7388 | $12 \cdot 7355$ | $11 \cdot 2275$ | $23 / 2$ | 2349 | 2386 | 2423 | 2460 | 2497 | 253 | 2571 | 2608 | 17 |
| 18 | 5158 | 5124 | 5089 | 5055 | 5020 | 4985 | 4951 | 4916 | 4881 | 13.4847 | 11.8879 | 8918 | 8958 | 8997 | 9036 | 9075 | 9115 | 9154 | 9193 | 9232 | 18 |
| 19 | 2667 | 2631 | 2594 | 2558 | 2521 | 2485 | 2448 | 2411 | 2375 | 14.2338 | 12.5483 | 5525 | 5566 | 5608 | 5649 | 5691 | 5732 | 5774 | 5815 |  | 19 |
| 20 | 0176 | 0138 | 0099 | 0061 | ${ }^{0} 022$ | 9984 | 9945 | 9907 | 9868 | 14.9830 | 13.2088 | 2131 | 2175 | 2219 | 2262 | 2306 | 2350 | 2393 | 2437 | 2480 | 20 |
| 21 | 7685 | 7644 | 760 | 756 | 7523 | 7483 | 443 | 7402 | 736 | 15.7321 | 13.8692 | 873 | 878 | 8830 | 8875 | 8921 | 8967 | 90 | 9059 | 9104 | 21 |
| 22 | 5194 | 5151 | 5109 | 5067 | 5024 | 4982 | 4940 | 4897 | 4855 | 16.4813 | 14.5296 | 5345 | 5393 | 5441 | 5489 | 5537 | 5585 | 5633 | 5681 | 5728 | 22 |
| 23 | 2702 | 2658 | 2614 | 2570 | 2526 | 2481 | 2437 | 2393 | 2348 | 17.2304 | 15.1901 | 1951 | 2001 | 2052 | 2102 | 2152 | 2202 | 2252 | 2302 | 23 | 23 |
| 24 | 0211 | 0165 | 0119 | 0073 | -027 | 9980 | 9934 | 9888 | 9842 | 17.9796 | $15 \cdot 8505$ | 8558 | 8610 | 8662 | 8715 | 8767 | 882 | 8872 | 8924 | 8977 | 24 |
| 25 | 7720 | 7672 | 7624 | 7576 | 28 | 7480 | 7432 | 7383 | 7335 | 18.7287 | $16 \cdot 5110$ | 5164 | 5219 | 5273 | 5328 | 538 | 543 | 5492 | 5546 | 560 | 25 |
| 26 | 5229 | 5179 | 5129 | \| 5079 | 5029 | 79 | 29 | 4879 | 4829 | 19.4779 | $17 \cdot 1714$ | 1771 | 1828 | 1884 | 1941 | 1998 | 2055 | 2111 | 2168 | 222 | 26 |
| 27 | 2738 | 2686 | 2634 | 2582 | 2530 | 2478 | 2426 | 2374 | 2322 | 20.2270 | 17.8318 | 8377 | 8436 | 8495 | 8554 | 8613 | 8672 | 8731 | 8790 | 884 | 27 |
| 28 | 0246 | 0193 | 0139 | 0085 | 0 | 9977 | 9923 | 9869 | 9816 | 20.9762 | 18.4923 | 4984 | 5045 | 5106 | 5167 | 5228 | 5289 | 5351 | 5412 | 5473 | 28 |
| 29 | 7755 | 769 | 7644 | 7588 | 7532 | 7476 | 7421 | 7365 | 7309 | 21.7253 | $19 \cdot 1527$ | 1591 | 1654 | 1717 | 1780 | 1844 | 1907 | 1970 | 2033 | 209 | 29 |
| 30 | 5264 | 5206 | 5149 | 5091 | 5033 | 4976 | 4918 | 4860 | 4802 | $22 \cdot 4745$ | 19.8132 | 8197 | 8263 | 8328 | 839 | 845 | 8524 | 8590 | 8655 | 8721 | 30 |
| 31 | 2773 | 27 | 265 | 2594 | 2534 | 2475 | 2415 | 235 | 22 | 23 | 20 | 48 | 48 | 4939 | 500 | 5074 | 51 | 5210 | 5277 | 5345 | 31 |
| 32 | 0282 | 0220 | 0159 | 0097 | 36 | 74 | 9912 | 9851 | 9789 | 23.9727 | $21 \cdot 1340$ | 1410 | 1480 | 1550 | 1620 | 1690 | 1759 | 1829 | 1899 | 196 | 32 |
| 33 | 7790 | 7727 | 7664 | 7600 | 7537 | 7473 | 7410 | 7346 | 7283 | 24.7219 | 21.794 | 8017 | 8089 | 8161 | 8233 | 8305 | 8377 | 8449 | 8521 | 859 | 33 |
| 34 | 5299 | 5234 | 5169 | 5103 | 5038 | 4972 | 4907 | 4841 | 4776 | 25.4710 | 22.4549 | 4623 | 4698 | 4772 | 4846 | 4920 | 4994 | 5069 | 5143 | 521 | 34 |
| 35 | 28 | 2741 | 2673 | 2606 | 2539 | 2472 | 04 | 37 | 69 | 26.2202 | $23 \cdot 1154$ | 230 | 1306 | 1383 | 1459 | 1536 | 161 | 1688 | 1764 | 184 | 35 |
| 36 | 0317 | 0248 | 0178 | 0109 | 1040 | 19971 | 9901 | 9832 | 9763 | 26.9693 | $23 \cdot 7758$ | 7837 | 7915 | 7994 | 8072 | 8151 | 8229 | 8308 | 8386 | 846 | 36 |
| 37 | 7826 | 7755 | 768 | 7612 | 7541 | 7470 | 7399 | 7327 | 7256 | $27 \cdot 7185$ | 24.436 | 4443 | 4524 | 4605 | 4685 | 4766 | 4847 | 4927 | 5008 | 508 | 37 |
| 38 | 5334 | 5261 | 518 | 5115 | 5042 | 4969 | 4896 | 4823 | 4750 | 28.4676 | $25 \cdot 0967$ | 1050 | 1133 | 1216 | 1299 | 1381 | 1464 | 1547 | 1630 | 171 | 38 |
| 39 | 2843 | 2768 | 2693 | 2618 | 2543 | 2468 | 2393 | 2318 | 2243 | 29-2168 | 25.7571 | 7656 | 7741 | 7827 | 7912 | 7997 | 8082 | 8167 | 8252 | 833 | 39 |
| 40 | 0352 | 0275 | 0198 | 0121 | 1044 | 9967 | 9890 | 9813 | 9736 | 29.9659 | 26.4175 | 4263 | 4350 | 4437 | 4525 | 4612 | 469 | 4786 | 4874 | 4961 | 40 |
| 41 | 78 | 7782 | 7703 | 7624 | 7546 | 7467 | 7388 | 7309 | 7230 | 307151 | $27^{\circ} \cdot 1780$ | 0869 | 0959 | 1048 | 1138 | 1227 | 13 | 1406 | 1496 | 1585 | 41 |
| 42 | 5370 | 5289 | 5208 | 5127 | 5047 | 66 | 885 | 4804 | 4723 | 314642 | 27.738 | 7476 | 7568 | 7659 | 7751 | 7843 | 7934 | 8026 | 817 | 820 | 42 |
| 43 | 2878 | 2796 | 2713 | 2630 | 2548 | 2465 | 2382 | 2299 | 2217 | 32.2134 | 28.3989 | 4083 | 4176 | 4270 | 4364 | 4458 | 4552 | 4645 | 4739 | 483 | 43 |
| 44 | 0387 | 0303 | 0218 | 0133 | -049 | 9964 | 9880 | 9795 | 9710 | 32.9625 | $29 \cdot 0593$ | 0689 | 0785 | 0881 | 0977 | 1073 | 1169 | 1265 | 1361 | 145 | 44 |
| 45 | 7896 | 7810 | 7723 | 7637 | 7550 | 7463 | 777 | 90 | 203 | 33.7117 | 29.719 | 7296 | 739 | 7492 | 7590 | 7689 | 7787 | 7885 | 7983 | 808 | 45 |
| 46 | 5405 | 5316 | 5228 | 5140 | 5051 | 4963 | 4874 | 4786 | 4697 | 34:4608 | 30.3802 | 3902 | 4003 | 4103 | 4203 | 4304 | 4404 | 4504 | 05 | 4705 | 46 |
| 47 | 2914 | 2823 | 2733 | 2643 | 2552 | 2462 | 2371 | 2281 | 2190 | $35 \cdot 2100$ | 31.0406 | 0509 | 0611 | 0714 | 0817 | 0919 | 1022 | 1124 | 1227 | 1329 | 47 |
| 48 | 0422 | 0330 | 0238 | 0146 | 1053 | 9961 | 9869 | 9776 | 9684 | 35.9591 | $31 \cdot 7011$ | 7115 | 7220 | 7325 | 7430 | 7534 | 7639 | 7744 | 7848 | 795 | 48 |
| 49 | 7931 | 7837 | 7743 | 7649 | 7554 | 7460 | 7366 | 7272 | 7177 | 36.7083 | 32.361 | 3722 | 3829 | 3936 | 4043 | 4150 | 4257 | 4363 | 4470 | 4577 | 49 |
| 50 | 5440 | 5344 | 5248 | 5152 | 5056 | 4959 | 4863 | 4767 | 4671 | 37-4574 | 33.0219 | 0329 | 0438 | 0547 | 065 | 0765 | 0874 | 098 | 109 | 1201 | 50 |
| 51 | 29 | 28 | 2753 | 2655 | 2557 | 2459 | 2360 | 2262 | 2164 | 38.2066 | 33'6824 | 6935 | 7046 | 715 | 726 | 7380 | 7492 | 7603 | 7714 | 7825 | 51 |
| 52 | 0458 | 0358 | 0258 | 0158 | 1058 | 58 | 9858 | 9758 | 9657 | 38.9557 | 34.3428 | 3542 | 3655 | 3769 | 3882 | 3996 | 4109 | 4222 | 4336 | 4813 | 52 |
| 53 | 7966 | 7865 | 7763 | 7661 | 7559 | 7457 | 7355 | 7253 | 7151 | 39.7049 | 35.0032 | 0148 | 0264 | 0380 | 0495 | 0611 | 0727 | 0842 | 0958 | 107 | 53 |
| 54 | 5475 | 5371 | 5268 | 5164 | 5060 | 4956 | 4852 | 4748 | 4644 | 40.4540 | 35*6637 | 6755 | 6873 | 6991 | 7108 | 7226 | 7344 | 7462 | 7579 | 769 | 54 |
| 55 | 298 | 2878 | 2773 | 67 | 2561 | 55 | 349 | 2244 | 2138 | $41^{\prime 2} 2032$ | $36 \cdot 3241$ | 336) | 348 | 3601 | 372 | 3842 | 3962 | 4081 | 201 | 432 | 55 |
| 56 | 0493 | 0385 | 0278 | 0170 | 62 | 9954 | 9847 | 9739 | 9631 | 41.9523 | $36 \cdot 9846$ | 9968 | 1090 | 0212 | 0335 | 04 | 79 | 0701 | 23 | 45 | 56 |
| 57 | 8002 | 789 | 778 | 7673 | 7563 | 7454 | 7344 | 7234 | 7124 | 42.7015 | 37-6450 | 6574 | 6699 | 6823 | 6948 | 7072 | 7196 | 7321 | 7445 | 756 | 57 |
| 58 | 5510 | 5399 | 5288 | 176 | 64 | 53 | 4841 | 4730 | 4618 | 43.4506 | $38 \cdot 3054$ | 3181 | 3308 | 3434 | 3561 | 3687 | 3814 | 3940 | 406 | 419 | 58 |
| 59 | 3019 | 2906 | 2792 | 2679 | 2566 | 2452 | 2338 | 2225 | 211 | 44.1998 | 38.9659 | 9788 | 9916 | +045 | 0174 | 0303 | 0431 | 0560 | 068 | 08 | 59 |
| 60 | 0528 | 0413 | 0297 | 0182 | P067 | 9951 | 9836 | 9720 | 9605 | 44.9489 | 39•6263 | 6394 | 6525 | 6656 | 6787 | 691 | 7049 | 718 | 73 | 744 | 60 |
| 61 | 803 | 79 | 7802 | 7685 | 68 | 7450 | 7333 | 7216 | 98 | $45^{\circ} 6981$ | 40.2868 | 3001 | 3134 | 3267 | 3400 | 3533 | 3666 | 3799 | 3932 | 406 | 61 |
| 62 | 5546 | 5426 | 5307 | 5188 | 5069 | 4950 | 4830 | 4711 | 4591 | 46.4472 | 40.9472 | 9607 | 9743 | 9878 | -013 | 0149 | 0284 | 0419 | 7176 | 73 | 62 |
| 63 | 3054 | 2933 | 2812 | 2691 | 2570 | 2449 | 2328 | 2206 | 2085 | 47•1963 | $41 \cdot 6076$ | 6214 | 6352 | 6489 | 6626 | 6764 | 6901 | 7039 | 76 | 731 | 63 |
| 64 | 0563 |  | 17 |  | -071 | 48 | 9825 | 9702 | 9578 | $47 \cdot 9455$ | $42 \cdot 2681$ | 2820 | 2960 | 3100 | 3240 | 3379 | 3519 | 3658 | 379 | 39 | 64 |
| 65 | 8072 | 7947 | 7822 | 7697 | 7572 | 7447 | 7322 | 7197 | 7072 | $48^{\circ} 6946$ | 42.9285 | 94 | 56 | 971 | 9853 | 9995 | 36 | 0278 |  | 0561 | 65 |
| 66 | 5581 | 5454 | 5327 | 200 | 5073 | 4946 | 4819 | 4692 | 4565 | 49.4438 | $43 \cdot 5889$ | 6034 | 6178 | 6322 | 6466 | 6610 | 6754 | 6898 | 7042 | 718 | 66 |
| 67 | 3090 | 2961 | 2832 | 2703 | 2574 | 2446 | 2317 | 2188 | 2059 | 50.1929 | 44.2494 | 2640 | 2787 | 2933 | 3079 | 3225 | 3371 | 3517 | 3663 | 380 | 67 |
| 68 | 0598 | 0468 | 0337 | 0206 | -076 | 9945 | 9814 | 9683 | 9552 | 50.9421 | 44.9098 | 9247 | 9395 | 9544 | 9692 | 9840 | 9989 | +137 | 028 | 043 | 68 |
| 69 | 8107 | 7975 | 7842 | 09 | 7577 | 7444 | 7311 | 7178 | 7045 | 51.6912 | 45.5703 | 5853 | 6004 | 6155 | 6305 | 6456 | 6606 | 6757 |  |  | 69 |
| 70 | 5616 | 5482 | 5347 | 5212 | 5078 | 4943 | 4808 | 4674 | 4539 | 52.4404 | 46.2307 | 2460 | 2613 | 2766 | 2918 | 3071 | 3224 | 337 | 352 | 368 | 70 |
| 71 | 3125 | 2988 | 2852 | 2715 | 2579 | 2442 | 2306 | 2169 | 2032 | 53.1895 | 46.89 | 9066 | 9222 | 9376 | 9531 | 9686 | 9841 | 9996 | 15 |  | 71 |
| 72 | 0634 | 0495 | 0357 | 0218 | toso | 9941 | 9803 | 9664 | 9526 | 53.9387 | $47 \cdot 5516$ | 5673 | 5830 | 5987 | 6145 | 6302 | 6459 | 6616 | 677 | 693 | 72 |
| 73 | 8142 | 8002 | 7862 | 7721 | 7581 | 7441 | 7300 | 7160 | 7019 | 54.6878 | 48.2120 | 2280 | 2439 | 2598 | 2758 | 2917 | 3076 | 3235 | 339 | 355 | 73 |
| 74 | 5651 | 5509 | 67 | 5225 | 5082 | 4940 | 4797 | 4655 | 4512 | 55.4370 | 48.8725 | 8886 | 9048 | 9209 | 9371 | 9532 | 9694 | 985 | 1016 | 0178 | 74 |
| 75 | 3160 | 3016 | 2872 | 2728 | 2583 | 243 | 2295 | 2150 | 2006 | $56^{1 / 1861}$ | 49.5329 | 5493 | 56 | 5820 | 598 | 6148 | 6311 | 6475 | 16638 | 6802 | 75 |
| 76 | 0669 | 0523 | 0377 | 0231 | 1084 | 9938 | 9792 | 9646 | 9499 | 56.9353 | 50.1933 | 2099 | 2265 | 2431 | 2597 | 2763 | 2929 | 3094 | 2260 |  | 76 |
| 77 | 8178 | 8030 | 7882 | 7734 | 7586 | 7437 | 7289 | 7141 | 6993 | 57.6844 | 50.8538 | 8706 | 8874 | 9042 | 9210 | 9378 | 9546 | 9714 | 9882 | . 05 | 77 |
| 78 | 5686 | 5537 | 5387 | 5237 | 5087 | 4937 | 4786 | 4636 | 4486 | 58.4336 59.1827 | 51.5142 | 5312 | 5483 | 5653 | 5823 | 5993 | 6164 | 6334 | 6504 | 667 | 78 |
| 79 | 3195 | 3043 | 2892 | 2740 | 2588 | 2436 | 2284 | 2132 | 1979 | 59.1827 | 52.1746 | 1919 | 2092 | 2264 | 2436 | 2609 | 2781 | 2953 | 3126 | 3298 | 79 |
| 80 | 0704 | 0550 | 0397 | 0243 | -089 | 9935 | 9781 | 9627 | 9473 | 59.9319 | 52.8351 | 8526 | 8700 | 8875 | 9050 | 9224 | 9399 | 9573 | 974 | 9922 | 80 |
| 81 | 8213 | 057 | 02 | 7746 | 7590 | 7434 | 7278 | 7122 | 6966 | 60.6810 | 53.4955 | 5132 | 5309 | 5486 | 5663 | 5839 | 6016 | 6193 | 6369 | 6546 | 81 |
| 82 | 5722 | 5564 | 5406 | 5249 | 5091 | 4933 | 4775 | 4618 | 4460 | $61 \cdot 4302$ | 54.1560 | 1739 | 1918 | 2097 | 2276 | 2455 | 2634 | 2812 | 2991 | 317 | 82 |
| 83 | 3230 | 3071 | 2911 | 2752 | 2592 | 2433 | 2273 | 2113 | 1953 | $62 \cdot 1793$ | 54:8164 | 8345 | 8527 | 8708 | 8889 | 9070 | 9251 | 9432 | 9613 | 9794 | 83 |
| 84 | 0739 | 0578 | 0416 | 0255 | 1093 | 9932 | 9770 | 9608 | 9447 | $62 \cdot 9285$ | 55.4768 | 4952 | 5135 | 5319 | 5502 | 5685 | 5868 | 605 | 623 | 6418 | 84 |
| 85 | 8248 | 8085 | 7921 | 58 | 7594 | 743 | 7267 | 7104 | 6940 | $63 \cdot 6776$ | $56 \cdot 1373$ | 1558 | 174 | 1930 | 211 | 230 | 2486 | 2671 | 2857 | 3042 | 85 |
| 86 | 5757 | 5592 | 5426 | 5261 | 5096 | 4930 | 4765 | 4599 | 4433 | 64\%4268 | 56.7977 | 8165 | 8353 | 8540 | 8728 | 8916 | 9103 | 9291 | 947 | 966 | 86 |
| 87 | 3266 | 3098 | 2931 | 2764 | 2597 | 2429 | 2262 | 2094 | 1927 | 65.1759 | 57.4582 | 4772 | 4962 | 5151 | 5341 | 5531 | 5721 | 5911 | 6100 | 62 | 87 |
| 88 | 0774 | 0605 | 0436 | 0267 | +098 | 9928 | 9759 | 9590 | 9420 | 65.9251 | 58.1186 | 1378 | 1570 | 1762 | 1954 | 2146 | 2338 | 2530 | 2722 | 2914 | 88 |
| 89 | 8283 | 8112 | 7941 | 7770 | 7599 | 7428 | 7256 | 7085 | 6914 | $66^{\circ} 6742$ | 58.7790 | 7985 | 8179 | 8373 | 8568 | ${ }_{5}^{8762}$ | 8573 | 9150 | 9344 | 9538 | 89 |
| 90 | 5792 | 5619 | 5446 | 5273 | 5100 | 4927 | 4754 | 4580 | 4407 | 67-4234 | 59.4395 | 4591 | 4788 | 4984 | 5181 | 5377 | 5573 | 577 | 596 | 616 | 90 |
| 91 | 3301 | 3126 | 2951 | 2776 | 2601 | 2426 | 2251 | 2076 | 1900 | $68 \cdot 1725$ | 60.0999 | 1198 | 1397 | 1595 | 1794 | 1992 | 2191 | 2389 | 2588 | 27 | 91 |
| 92 | 0810 | 0633 | 0456 | 0279 | -102 | 9925 | 9748 | 9571 | 9394 | 68.9217 | 60.7604 | 7804 | 8005 | 8206 | 8407 | 8608 | 8808 | 900 | 92 | 941 | 92 |
| 93 | 8318 | 8140 | 7961 | 7782 | 7603 | 7424 | 7245 | 7066 | 6887 | 69.6708 | $61 \cdot 4208$ | 4411 | 4614 | 4817 | 5020 | 5223 | 5426 | 56 | 58 | 603 | 93 |
| 94 | 5827 | 5647 | 5466 | 5285 | 5104 | 4924 | 4743 | 4562 | 4381 | 70.4199 | $62^{\circ} 0812$ | 1018 | 1223 | 1428 | 1633 | 1838 | 2043 | 2248 | 2453 | 26 | 94 |
| 95 | 3336 | 3154 | 2971 | 2788 | 2606 | 2423 | 2240 | 2057 | 1874 | $71 \cdot 1691$ | 62.7417 | 762 | 7832 | 8039 | 8246 | 8454 | 8661 | 88 | 9075 | 92 | 95 |
| 96 | 0845 | 0660 | 0476 | 0291 | -107 | 9922 | 9737 | 9552 | 9367 | 71.9182 | 63*4021 | 4231 | 4440 | 4650 | 4859 | 5069 | 5278 | 5488 | 5697 | 590 | 96 |
| 97 | S 5 | 8167 | 7981 | 7794 | 7608 | 7421 | 7234 | 7048 | 6861 | 72.6674 | 64.0625 | 0837 | 1049 | 1261 | 1473 | 1684 | 1896 | 2107 | 2319 | 253 | 97 |
| 98 | 5862 | 5674 | 5486 | 5297 | 5109 | 4920 | 4732 | 4543 | 4354 | $73 \cdot 4165$ | 64.7230 | 7444 | 7658 | 7872 | 8086 | 8299 | 8513 | 8727 | 594 | 9154 | 98 |
|  | 3371 | 3181 | 2991. | 2800 | 2610 | 2420 | 229 | 2038 | 1848 | 74.1657 | $65 \cdot 3834$ | 4050 | 4267 | 4483 | 4699 | 4915 | 5131 | 534 | 5562 |  | 99 |
| 100 | 0880 | 0688 | 0496 | 0303 | 1111 | 9919 | 9726 | 9534 | 9341 | 74.9148 | 66.0439 | 0657 | 0875 | 1094 | 1312 | 1530 | 1748 | 1966 | 2184 | 2402 | 100 |
|  | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | $37^{\prime}$ | $36^{\prime}$ | $35^{\prime}$ | $34^{\prime}$ | $33^{4}$ | $32^{\prime}$ | $31^{\prime}$ | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | 37 | $36^{\prime}$ | $35^{\prime}$ | $34^{\prime}$ | \| 33' |  |  |  |
|  |  |  |  |  |  | NE. |  |  |  |  |  |  |  |  | Cos | NE. |  |  |  |  |  |

TRAVERSE TABLES．

| $41^{\circ}$ | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $41^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | $34^{\prime}$ | $35^{\prime}$ | $36^{\prime}$ | $37^{\prime}$ | $38^{\prime}$ | $39^{\prime}$ |  | 31＇ | $32^{\prime}$ | 33 | $34^{\prime}$ | 35 | $36^{\prime}$ | 37 | 33 |  |  |
|  | 7490 | 748 | 748 | 748 | 7482 | 748 | 74 | 747 | 747 | 7472 | 62 | 66 | 66 | 6633 | 6635 | 6637 | 6639 | 6641 |  |  |  |
|  | 497 | 4975 | 497 | 496 | 4 | 49 | 49 | 4952 | 4948 | $1 \cdot 4944$ | 325 | 32 | 32 | 3265 | 32 | 3274 | 3279 | 3283 | 3287 |  |  |
|  | 2469 | 2463 | 2457 | 245 | 2446 | 2440 | 243 | 2428 | 2422 | $2 \cdot 24$ | ．987 | 9885 | 9892 | 98 | 990 | 9911 | 9918 | 9924 | 993 | 993 |  |
|  | 995 |  | 9943 |  |  |  |  |  | 9896 | 2.9889 | $2 \cdot 6505$ | 65 | 652 | 65 | 6540 | 6548 | 6557 | 6566 | 6574 | 6583 |  |
| 5 | 7448 | 7438 |  |  |  |  |  |  | 737 |  |  |  | 3153 | 3164 | 317 | 3185 | 3196 | 320 | 3218 |  | 5 |
| 6 | 49 | 4926 | 49 | 4903 | 4891 | 4879 | 4868 | 4856 | 4845 | 4.4833 | 3.9757 | 9770 | 9783 | 9796 | 9809 | 323 | 9836 | 9849 | 9862 | 9875 |  |
|  | 2427 | 2413 | 2400 | 238 | 2373 | 2359 | 234 | 2332 | 23 |  |  | 639 | 64 | 64 | 6444 | 6460 | 647 | 6490 | 6505 | 6520 |  |
|  | 991 |  | 988 | 987 | 9855 | 983 | 98 | 9808 | 9793 | 5 | ． 30 | 30 | 3044 | 30 | 30 | 3097 | 311 | 3173 | 3149 |  |  |
|  | 7406 | 738 | 737 | 735 | 7337 | 7319 | 7302 | 7284 | 7267 | 6.7250 | 5.96 | 96 | 96 | 96 | 97 | 9734 | 975 | 977 | 9793 |  |  |
| 10 | 4896 | 487 | 485 | 4838 | 4818 | 4799 | 4780 | 4760 | 47 | 74722 | 6.6262 | 628 | 6306 | 632 | 6349 | 6371 | 639 | 641 | 643 | 445 | 0 |
| 11 | 2385 | 2364 | 23 |  |  |  |  |  |  |  |  |  |  |  |  | 3008 | 3032 |  |  |  | 1 |
| 12 | 987 | 9852 | 9828 |  |  |  |  | 9713 | 9689 |  | 795 | 954 | 95 |  |  | 9645 | 967 | 9697 |  |  | 12 |
| 13 | 736 | 7339 | 73 | 728 | 72 | 7239 | 7214 | 7189 | 7164 | 713 | 8 | 616 | 6197 | 62 | 62 | 6282 | 6310 | 6339 | 63 | 639 | 13 |
| 14 | 4854 | 482 |  | 477 | 47 | 4719 | 4692 | 4665 | 4638 | 10．461 | 276 | 279 | 2828 | 2858 | 28 | 2919 | 2950 | 298 | 30 | 304 | 14 |
| 15 | 2343 | 2314 | 2286 | 2257 | 2228 | 99 | 2170 | 2141 | 2112 | $11 \cdot 2083$ | 9393 | 942 | 94 | 9491 | 9524 | 9556 | 9589 | 9622 | 9654 | 9687 | 15 |
| 16 | 983 | 9802 | 9771 | 9740 | 9709 | 9679 | 9648 | 9617 | 9586 | 11. | 10.6019 | 6054 | 6089 | 6124 | 6159 | 6193 | 6228 | 6263 | 6298 | 6333 | 16 |
| 17 | 7322 | 7290 |  | 72 |  | 7159 | 7126 | 7093 | 7060 | 12 | 11.26 | 26 | 27 |  | 2793 | 2830 | 28 | 29 | 2941 |  | 17 |
| 18 | 4812 | 4777 | 4743 | 4708 | 4673 | 38 | 4604 | 4569 | 453 | 13 | 11.9272 | 931 | 9350 |  |  | 9468 | 9507 | 95 | 9585 |  | 18 |
| 19 | 23 | 2265 | 2228 |  |  | 2118 |  | 2045 | 2008 | 14.1 | 12 | 59 | 59 | 60 | 60 | 610 | 614 | 616 | 622 | 6270 | 19 |
| 20 | 97 | 9753 |  |  |  |  |  |  |  | 14.9444 | 13.25 | 2568 | 2611 | 26 | 2698 | 274 | 278 | 282 | 2872 | 29 | 20 |
| 21 | 72 | 7240 |  |  |  | 7078 |  | 6997 | 6956 | 15.6916 | 13.9150 | 9196 | 924 |  |  |  |  |  |  |  | 21 |
| 22 | 4770 | 4728 | 468 | 464 | 4601 | 4558 | 4516 | 4473 | 443 | 16.43 | 14 | 582 | 58 | 592 |  | 60 | 6064 | 6112 | 6159 |  | 22 |
| 23 | 22 | 2215 | 21 | 21 |  | 2038 | 1994 | 1949 | 1905 | 17：186 | 15 | 2453 | 25 | 25 | 2603 | 2653 | 270 | 2753 | 28 | 28 | 23 |
| 24 | 97 | 9703 |  |  |  |  | 9472 | 9425 | 9379 |  |  | 908 | 91 | 9186 | 9238 | 929 | 93 | 9394 | － |  | 24 |
| 25 | 7239 | 719 | 7143 | 7094 | 7046 | 6998 | 6950 | 6901 | 685 | $18^{\circ}$ | 16.56 | 57 | 57 | 581 | 587 | 592 | 598 | 603 | 609 | 6145 | 25 |
| 26 | 47 | 467 | 4628 | 4578 | 4528 | 4478 | 4428 | 4377 | 4327 | 19•4277 | 17 | 2338 | 2394 | 24 | 2508 | 256 | 2621 | 2677 | 2734 | 2790 | 26 |
|  | 2218 | 21 |  |  |  | 1958 | 1905 | 1853 |  | 20 | 17 |  | 9025 |  | 9143 | 20 | 926 | 9319 | 378 |  | 27 |
| 28 | 970 | 96 | 96 | 9546 | 9492 | 38 | 93 | 9329 | 927 | 20 | 18. | 559 | 565 | 5717 | 57 | 5838 | 5899 | 59 | 6021 | 608 | 28 |
| 29 | 71 |  |  |  |  |  | 6861 | 6805 | 6749 | 21 | 19.21 | 22 | 22 |  | 2412 | 2476 | 253 | 2602 | 26 | 728 | 29 |
| 30 | 4687 | 462 | 457 |  |  | 4397 | 4339 | 4281 | 24 | 22 | 19.8786 |  | 8917 |  | 9047 | 113 | 17 | 9243 |  |  | 30 |
| 31 | 21 | 2116 | 2057 |  |  |  |  | 1758 | 1698 | 23．163 | $20 \cdot 5412$ |  | 5547 |  | 5682 | 575 | 581 |  |  |  |  |
| 32 | 96 | 960 | 954 | 9481 |  | 9357 | 9295 | 9234 | 9172 |  |  | 210 | 2178 | 2247 | 2317 | 23 | 2456 | 2526 | 2596 | 266 | 32 |
| 33 |  |  |  |  | 6901 | 337 | 67 | 6710 | 6 | ．65 | 21 |  |  | 88 | 89 | 902 | 90 |  |  | 331 | 33 |
| 34 | 464 | 457 | 45 | 4448 | 83 | 4317 | 42 | 4186 | 41 | 25 | 22．52 |  | 5439 |  | 55 | 566 | 573 | 580 | 58 | 59 | 34 |
| 35 | 2134 | 2067 | 20 | 1932 | 64 | 797 | 1729 | 1662 | 1594 | 26.1 | 23．19 | 19 | 20 | 21 | 222 | 229 | 237 | 24 | 25 | 26 | 35 |
| 36 | 9624 | 9555 | 9485 | 9416 | 9346 | 9277 | 9207 | 9138 |  | 26.8999 | 23.8543 | 8622 | 8700 | 8778 | 8857 | 8935 | 9013 | 9092 | 9170 | 9248 | 36 |
| 37 | 7114 | 7042 |  |  | 10 | 6757 | 6685 | 66 | 65 | $27 \cdot 6471$ |  |  |  |  |  | 5572 | 5653 |  |  |  | 37 |
| 38 | 4603 | 453 | 44 | 43 | 10 | 4237 | 4163 | 409 | 40 | 28 | 25 | 187 | 196 | 20 | 2127 | 22 | 2292 | 2375 | 2457 | 254 | 38 |
| 39 | 20 | 201 |  |  | 1792 | 1717 | 1641 | 15 | 1491 | 29.1 | 25 | 85 | 85 | 86 | 8761 | 884 | 8931 | 90 |  |  | 39 |
| 40 | 958 | 950 |  |  |  | 9196 | 91 |  | 8965 | 29.8887 | $26^{5048}$ |  |  |  | 5396 |  | 557 |  |  |  | 40 |
| 41 | 7072 | 699 | 69 | 6835 | 6756 | 6676 | 6597 |  | 6439 | 30．6360 | $27^{\prime} 167$ |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 456 | 448 | 439 | 4318 | 4237 | 4156 | 407 |  | 391 | 31.3832 |  |  |  |  |  | 8758 |  | 8940 |  |  | 42 |
| 43 | 20 |  |  | 1802 | 1719 | S6 | 1553 | 1470 | 138 | 32．1304 | 28 |  |  | 5208 | 5301 | 5395 | 5488 | 5582 |  |  | 43 |
| 44 | 954 | 945 | 937 | 9286 |  | 16 | 9031 | 89 | 886 | 32 |  |  |  | 18 | 193 | 2032 | 2128 | 2223 |  |  | 44 |
| 45 | 7030 | 69 | 68 | 6770 | 6683 | 6596 | 6509 | 6422 | 6335 | 33 | $29 \cdot 8$ | 82 | 83 | 847 | 857 | 86 | 87 | 88 | 8963 | 906 | 45 |
| 46 | 4520 | 443 | 4342 | 4254 |  |  |  | 389 |  | 34．3720 | 30＇480 |  |  | 5106 |  | 5306 |  |  |  |  | 46 |
| 47 | 20 |  |  | 1737 | 1648 | 1556 | 1465 | 137 | 1283 | 35.1193 | 31.14 |  |  | 1738 |  | 1943 |  |  |  |  | 47 |
| 48 | 94 | 9406 |  | 9221 | 9128 | 9036 | 89 | 885 | 8758 | 35.8665 | 31 |  |  |  | 8476 |  |  |  |  |  | 48 |
| 49 |  |  |  |  |  | 16 | 6421 | 6326 | 6 | $36 \cdot$ | 32 |  |  | 50 | 511 | 521 | 53 | 5430 | 5537 |  | 9 |
| 50 | 4478 | 43 | 428 | 89 | 4092 |  | 899 | 3802 | 3706 | 37．3609 | 33．13 | 14 | 1528 | 1637 | 746 | 185 | 1963 | 2072 | 2181 | 228 | 50 |
| 51 | 196 |  |  |  |  |  |  |  |  |  |  | 80 | 8158 | 82 |  |  |  |  |  |  |  |
| 52 | 945 | 935 | 925 | 9156 | 9056 | 895 | 8855 |  |  | 38.8554 | 34 |  |  | 4902 | 5015 | 51 | 52 |  |  |  |  |
| 53 | 694 | 684 | 67 | 6640 | 538 | 6435 | 633 | 623 | 6128 | 39.602 | 35 |  | 1420 | 1535 | 1650 | 176 | ， |  |  |  |  |
| 54 | 443 | 433 | 42 | 4124 |  |  |  |  |  |  |  |  |  |  | 82 | 84 |  |  |  |  |  |
| 55 | 192 | 1820 | 1714 |  | 1501 | 1395 | 1289 | 1183 | 1076 | 41 | 36 | 45 | 4681 | 48 | 492 | 5040 | 5159 | 5279 | 5399 | 5518 | 55 |
| 56 | 94 | 9307 | 9199 |  | 8983 | 8875 |  | 865 |  | 41．8442 | 37．106 |  |  |  |  | 1677 |  |  |  |  | 56 |
| 57 | 69 | 679 | 66 | 657 | 6465 | 63 | 624 | 61 | 6025 | 42.59 | 37＇7603 | 78 | 79 | 80 | 8190 | 8314 | 8438 | 85 | 8686 | 881 | 57 |
| 58 | 43 | 428 | 417 | 40 |  | 38 | 3723 | 3611 |  | 43.33 | $38^{\circ} 43$ |  |  | 4699 | 4825 | 495 | 507 | 520 |  |  | 58 |
| 59 | 188 | 70 | 56 | 43 | 429 | 315 | 1201 | 108 | 0973 | 44.0859 | 39.09 |  | 1203 | 1331 | 1450 | 15 | 17 | 1845 | 1973 |  | 59 |
| 60 | 937 | 925 | 9142 | 9026 | 8911 | 8795 | 8679 | 8563 | 84 | $44 \cdot 833$ | 39.75 | 7703 | 783 | 796 | 8095 | 822 | 835 | 848 | 861 | 874 | 60 |
| 61 | 686 |  |  |  |  | 275 |  |  |  |  | 40.4198 | 43 |  |  |  | 486 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | ．327 | 41.08 |  |  | 1230 |  | 149 |  |  |  |  |  |
| 63 | 1842 | 17 | 15 | 1478 | 135 | 1234 | 111 | 099 | 086 | 47.07 | $41 \cdot 7$ | 75 | 7725 | 7862 | 799 | 8136 | 827 | 841 | 8548 |  |  |
| 64 | 933 | 92 |  |  | 8838 | 8714 |  |  |  | $47 \cdot 82$ | 42.4071 |  | 43 | 44 | 4634 | 4774 | 49 |  |  |  | 64 |
| 65 | 682 |  |  |  |  | 6194 |  |  |  | 48.5692 | 43.0 |  |  |  |  | 141 |  |  |  |  | 65 |
| 66 | 431 |  |  |  |  | 367 |  |  |  |  | 43.732 |  |  |  | 790 | 304 |  |  |  |  | 66 |
| 67 | 180 | 167 |  | 14 | 1283 | 115 | 102 | 089 | 076 | 50.0 | $44 \cdot 39$ | 41 | 42 | 43 | 453 | 46 | 4831 | 4976 |  |  | 67 |
| 68 |  |  |  |  |  |  |  |  |  | － 8 | 45 |  |  |  | 1174 | 132 |  |  |  |  | 68 |
| 69 | 677 | 66 | 6513 | 6380 | 6247 | 6114 | 5981 | 5847 | 5714 | 51.558 | $45 \cdot 72$ | 73 | 75 | 7659 | 7809 | 79 | 81 | 82 | 8409 | 852 | 69 |
| 70 | 426 | 4134 | 399 | 3864 | 3729 | 3594 | 3459 | 3323 | 3188 | 52．3053 | 46.383 | 398 | 413 | 4291 | 444 | 459 | 474 | 490 | 505 | 520 | 70 |
| 71 | 172 |  |  |  | ， | 107 |  |  |  |  |  | 0615 | 0770 |  |  |  |  |  |  |  |  |
| 72 | 92 |  | 897 |  | ， | 855 | 841 | 8276 | 813 | 53＇79 |  |  |  | T5 | ， |  |  |  |  |  |  |
| 73 | 6738 | 659 | 645 | 6315 | 6174 | 60 | 5893 | 5752 | 561 | 54．546 | 48．3713 | 387 | 4031 | 4190 | 4348 | 450 | 466 | 4825 | 4984 | 514 |  |
|  |  |  |  |  |  |  | 337 |  |  | 55.2942 | 033 |  | 061 | d | 砣 | 174 | ， |  | 27 | 178 |  |
| 75 | 1717 | 1572 | 1428 | 83 | 38 | 0993 | 084 | 070 | 055 | 56.041 | 49.696 | 712 | 7292 | 745 | 761 |  | 78 | 108 | 87 | 843 | 75 |
| 76 | 9206 | 9060 | 89 | 8767 | 8620 | 8473 | 832 | 8180 | 33 | 56.7886 | $50 \cdot 35$ | 13757 | 3922 | 4088 | 425 | 4419 | 4584 | 4749 | 4915 |  | 76 |
| 77 | 6696 | 654 | 63 | 6250 | 6102 | 5953 | 5805 | 5656 | 5507 | 57．5358 | 51.021 | 0385 | 0553 | 0721 | 088 | 1056 | 122 | 1391 | 1558 | 172 | 77 |
| 78 | 4185 |  | 3875 |  | 3584 | 3433 |  | 3132 | 28 | 58.2830 |  | ， | 181 | 7353 | \％ | 7693 | 析 | 803 |  | 837 | 78 |
| 79 | 1675 | 1523 | 137 | 1218 | 1066 | 0913 | 0760 | 0608 | 0455 | 59.0303 | 52．3470 | 3642 | 3814 | 3986 | 415 | 4330 | 450 | 4674 | 4845 | 501 | 79 |
| 80 | 916 | 9010 | 8856 | 8702 | 8547 | 8393 | 8238 |  | 7929 | $59 \cdot 777$ | 53.009 | 0270 | 0445 | 0619 | 079 | 0967 | 1141 | 13 | 1489 | 166 | 80 |
| 81 | 665 | 6a |  |  |  |  |  |  |  |  |  |  |  |  |  | 60 |  |  |  |  |  |
| 82 | 41 | 3986 | 3827 |  | 3511 | 3353 | 3194 | 3036 | 2878 | 61.2719 | $54 \cdot 33$ | 3527 | 3706 | 3884 | 4063 | 4241 | 4419 | 4598 | 4776 |  | 82 |
| 83 | 1633 | 147 | 1313 | 53 | 0993 | 083 | 0672 | 05 | 352 | 62.019 | $54 \cdot 997$ | －155 | 0336 | 0517 | 069 | 087 | 10 | 1239 | 1420 | 16 |  |
| 84 | 9123 | 961 | 8 | ， | 5 | 8313 | ， |  |  | 62 \％63 | 55.6601 | 684 | 6967 | 7150 | 7332 | 7515 | 保 |  | 8063 |  | 84 |
| 85 | 6612 | 6448 | 6285 | 6121 | 5957 | 5793 | 562 | 5464 | 5300 | 63.5136 | 56：322 | 3412 | 3597 | 3782 | 396 | 415 | 433 | 4522 | 4707 | 489 | 85 |
| 86 | 4102 | 39 | 3770 | ${ }^{3604}$ | 38 | 327 | 310 | 2940 | 774 | 64．2608 | 56．985 | 1041 | 0228 | 0415 | 0602 | 0789 | 0977 | 1164 | 135 | 153 | 86 |
| 87 | 159 | 1424 | 源 | dos | 22 | 0752 | ， | 0416 | 0248 | 65．008 | 57．647 | 666 | 6858 | 7048 | 7237 | 7427 | 7616 | 7805 |  | 左 |  |
| 88 | 908 | 891 | 8742 | 8572 | 8402 | 8232 | 8062 | 7892 | 7722 | $65 \cdot 7552$ | 58.310 | 3297 | 3489 | 3681 | 3872 | 4064 | 4255 | 4446 | 4638 | 482 | 88 |
| 89 | 6571 | 6399 | 6227 | 6056 | 5884 | 5712 | 5540 | 5368 | 5196 | $66 \cdot 5024$ | 58.973 | 9926 | －120 | 0313 | 050 | 0701 | 089 | 1088 | 128 | 147 | 89 |
| 90 | 40 | 38 |  |  | 3366 |  | 3018 |  | 2671 | 249 | 59＇6358 | 6554 |  | 694 | 142 |  | 7534 | 7729 | 7925 | 812 | 90 |
| 91 | 1550 | 1374 |  |  |  |  |  |  |  |  |  |  | 338 |  | － | 997 | 413 | 12 |  |  |  |
| 92 | 9039 | 8862 | 8684 | 8507 | 8329 | 8152 | 7974 | 779 | 7619 | 68.7441 | 60．9610 | 9811 | 1011 | 0212 | 0412 | 061 | 081 | 1012 | 1212 | ， | 92 |
| 9 | 6529 | 6349 | 6170 | 5991 | 811 | 5632 | 5452 | 5273 | 5093 | $69 \cdot 4913$ | $61 \cdot 623$ | 6439 | 6642 | 6844 | 7047 | 7249 | 7451 | 7654 | 7856 | 805 | 93 |
| 94 | 4018 | 3837 | 3656 | 3475 | 3293 | 3112 | 2930 | 2749 | 2567 | 70.2385 | $62 \cdot 2863$ | 3068 | 3272 | 3477 | 3682 | 3886 | 4091 | 4295 | 4500 | 470 | 94 |
| 95 | 150 | 25 | 1142 | 0958 | 0775 | 0592 | 0408 | 0225 | 21 | 70.9857 | $62 \cdot 9489$ | 9696 | 9903 | －110 | 0316 | 0523 | 073 | 093 | 1143 | 135 | 95 |
| 96 | 899 | 12. | 27 |  | 8257 | 8072 | 7886 | 7701 | 15 | 71.7330 | 63.6115 | 234 | 6533 | 6742 | 595 | 7180 | 7369 | 7578 | 778 | 7995 | 96 |
| 97 | 6487 | 6300 | 6113 | 34 | 5739 | 55 | 5364 | 517 | 4989 | 72．4802 | 64.2741 | 2953 | 3164 | 3375 | 5386 | 3797 | 4008 | 42 | 4430 | 64 | 97 |
| 98 | 3977 | 3788 | 359 | 3410 | 3221 | 3031 | 2842 | 2653 | 2463 | 73.2274 | 64.9368 | 9581 | 9795 | ＋008 | 02 | 0435 | 0648 | 08 | 10 | 128 | 98 |
|  | 1466 | 1275 | 84 |  | 02 | ， | 0320 | 129 | 9938 | 73.9746 | $65 \cdot 5994$ | 6210 | 6425 | 664 | 6856 | 7072 | 7287 | 7502 | 7718 | 93 | 98 |
| 10 | 8956 | 8763 | 8570 | 8377 | 8184 | 7991 | 7798 | 7605 | 7412 | 74.721 | $66^{2620}$ | 2838 | 3056 | 3273 | 3491 | 3709 | 3926 | 4144 | 4361 | 4579 | 00 |
|  | $30^{\prime}$ | 29 | $28^{\prime}$ | 27 | $26^{\prime}$ | 25 | 24 | $23^{\prime}$ | $22^{\prime}$ | $21^{\prime}$ | $3{ }^{\prime}$ | 29 | 28 | $27^{\prime}$ | $26^{\prime}$ | $25^{\prime}$ | $24^{\prime}$ | ， |  | $21^{\prime}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | SINE． |  |  |  |  |  |

TRAVERSE TABLES．

| 4 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $41^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\prime}$ | $41^{\prime}$ | $42^{\prime}$ | 43 | $44^{\prime}$ | $45^{\prime}$ | $46^{\prime}$ | 47 | 48＇ | $49^{\prime}$ | 40 | $41^{\prime}$ | 42＇ | 43＇ | $44^{\prime}$ | $45^{\prime}$ |  |  |  |  |  |
|  | 7470 | 7468 | 7466 | 7464 | 7463 | 7461 | 7459 | 7457 | 7455 | 745 | 64 | 6650 | 6652 | 6654 | 6657 | 6659 | 6661 | 6663 | 6665 | 6667 |  |
| 2 | 49 | 4937 |  |  | 4925 | 4921 | 4 |  |  |  | ， 32 | 330 | 330 | 33 | 3313 | 33 | 332 | 3326 | 3331 | 333 |  |
|  | 2411 | 2405 | 2399 | 2393 | 2388 | 2382 | 2376 | 2370 | 236 |  |  | 99 | 995 | 996 | 097 | 998 | 99 | 9989 | 9996 | dot |  |
|  |  |  |  | 9858 | 9850 |  | 9835 | 9827 | 9819 |  | － 6 | 660 | 6609 | 6618 | 6627 | 663 | 6644 | 6653 | 6661 | 67 |  |
| 5 | 351 | 7342 | 7332 | 7322 |  |  |  |  | 274 | $3 \cdot 7264$ | 3.3240 | 3251 | 3262 | 3272 | 328 | 329 | 330 | 331 | 33 | 333 |  |
| 6 | 4822 | 4810 | 4798 | 4787 | 4775 |  |  |  | 4729 | 44717 | 3.9888 | 9901 | 99 | 9927 | 9940 | 9953 | 9966 | 9979 | 9992 | 1005 |  |
|  | 22 | 2278 | 226 | 2251 |  |  | 2210 | 219 | 2183 |  |  |  | 6566 | 6581 | 6597 | 6612 | 6627 |  |  |  |  |
|  | 9762 |  |  |  |  |  | 9669 |  | 963 |  | 5.318 |  | 3218 | 32 | 3253 | 3271 | 328 | 3305 |  |  |  |
| 9 | 32 | 72 | 7197 | 7180 | 7163 | 7145 | 7128 | 7110 | 70 |  |  | 98 | 987 |  | 99 | 9929 | 994 |  |  |  |  |
| 10 | 析 | 468 | 468 | 4644 | 2625 | 4606 | 4586 | 4567 | 4548 | 4528 | 6.6480 | 6501 | 23 | 6545 | 6566 | 6588 | 661 | 6632 | 6653 | 6675 |  |
| 11 | 21 |  |  |  |  |  |  |  |  | 8.1981 | ． 3128 | 315 | 3175 | 199 | 3223 | 3247 | 3271 | 3295 |  |  | 11 |
| 12 | 943 | 9620 |  |  |  |  |  |  | 945 |  | 977 | 98 | 9828 |  | 9880 | 99 | 99 | 58 | 4 | ＋017 |  |
| 13 | 7113 | 888 | 706 |  | 7013 | 6987 | 6962 | 6937 | 697 | \％887 | 6423 | 6452 | 80 |  | 65 | 6565 | 6593 | 6621 | 6649 |  | 13 |
| 14 | 4584 |  | 452 |  | 4475 |  | 4421 | 4394 | 436 | $10^{\circ}$ |  |  | 3132 | 3163 | 3193 | 3223 | 3254 | 3284 | 3315 | 33 | 14 |
| 15 | 54 | 2025 | 1996 | 1967 | 1938 | 1909 | 1880 | 1850 | 1821 | 11 | 9.9719 | 752 | 9785 | 981 | 9850 | 988 | 99 | 99 | 998 | －012 | 15 |
| 16 | 9524 | 9493 | 9462 | 9431 | 9400 | 9369 | 9338 | 9307 | 92 | 11 | 10.6367 | 6402 | 6437 | 6472 | 6506 | 6541 | 65 | 10 | 5 |  | 6 |
| 17 | 6994 | 696 |  |  |  |  |  |  | 673 | 12.66 |  |  |  | 3126 |  | 3200 | 22 | 274 | 3311 | 3347 | 17 |
| 18 | 446 | 4430 | 4395 | 4360 | 4325 |  | 425 | 42 | 4186 | 13.41 |  | 970 | 9741 | 9781 | 9820 | 9859 | 9898 | 9937 | 9976 | －015 | 18 |
| 19 | 1935 |  | 186 |  |  |  | 171 | 167 | 1640 | 14.16 | 1 | 6352 | 639 | 6435 | 64 | 65 | 6559 | 6600 | 6641 |  | 19 |
| 20 | 9405 |  |  |  |  | 9211 | 9173 | 9134 | 9095 | 14.9056 | 13.2959 |  |  | 3090 |  | 3176 | 322 | 326 | 3307 |  | 20 |
| 21 | 6875 |  |  |  |  |  |  |  |  |  | 13.9607 | 9653 | 9698 | 974 | 9790 | 983 | 988 | 9926 | 9972 |  | 21 |
| 22 | 4346 | 4303 | 426 | 4218 |  |  |  |  |  |  | 14.62 |  | 6351 |  | 6446 | 6494 | 6542 | 6589 | 6637 |  | 22 |
| 23 | 1816 | 177！ | 1727 | 1682 | 1638 |  | 154 |  |  | $17 \cdot 14$ | 15.29 |  |  |  |  |  | 22 | 3253 | 3302 |  | 23 |
| 24 | 9286 | 9240 |  |  | 9100 |  | 9007 |  |  | 17.886 |  |  | 965 |  |  | 9812 | 986 |  | 9968 |  | 24 |
| 25 | 6756 | 6708 | 666 | 66 | 6563 | 6514 | 6466 | 6417 | 636 | $18^{\circ} 632$ | 16.6 | 6253 | 6308 | 6362 | 6416 | 6470 | 65 | 6579 | 6633 |  | 25 |
| 26 | 42 | 4176 | 4126 | 4076 | 4025 | 3975 | 3925 | 3874 | 3824 | 19 | 17.284 | 2903 | 2960 | 3016 | 307 | 3129 | 3186 | 3242 | 3298 |  | 26 |
| 27 | 1697 |  |  |  |  |  |  |  |  |  | 17.94 |  | 9612 |  |  |  |  |  |  |  | 27 |
| 28 | 9187 | 9113 |  |  |  |  |  |  | 873 | 20.86 | 18.61 |  | 62 | 63 | 63 | 6447 | 6508 | 6568 | 6629 | 669 | 28 |
| 29 | 6637 | 658 | 652 |  | 6413 |  |  | 62 |  | 21.613 | 19.27 |  | 29 |  |  | 3106 |  | 323 | 329 |  | 29 |
| 30 | 1 | 40 | 399 | 3933 | 3875 | 3817 | 3759 | 3701 | 3643 | 22358 | 19.9439 |  | 956 |  |  | 976 |  |  |  |  | 30 |
| 31 |  |  |  |  |  |  |  |  |  |  | $20 \cdot 608$ |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 90 |  | 89 |  |  | 8738 | 867 | 8614 | 855 |  | 21 |  | 2874 |  |  |  |  | 3221 |  |  | 32 |
| 33 | 65 | 6454 | 639 |  |  |  |  |  |  | 24.59 | ．938 |  | 95 | 95 |  |  |  | 884 |  |  | 33 |
| 34 |  | 3923 |  |  |  |  |  |  |  |  |  |  | 617 | 625 |  | 64 | 6474 | 6547 | 662 |  | 34 |
| 35 | 145 | 139 | 132 | 1256 | 1188 | 1120 | 1052 |  | 0917 | 26.0849 | 23.2679 | 27 | 283 | 29 | 2983 | 3059 | 3135 | 3210 | 3286 | 336 | 35 |
| 36 | 89 | 8859 | 8790 | 8720 | 8650 | 8581 | 8511 | 844 | 837 | 26 ＇8302 | $23 \cdot 9327$ | 9405 | 9483 |  |  | 9717 | 9796 | 19874 | 19952 |  | 36 |
| 37 | 63 |  |  |  |  |  |  |  |  |  | 24.59 |  |  |  |  | 6376 | 6457 | 6537 |  |  | 37 |
| 38 | 3870 | 379 | 372 |  | 3575 | 3502 | 342 | 335 |  | $28 \cdot 32$ | $25 \cdot 26$ | 27 | 27 | 28 | 29 | 3035 | 3118 | 320 | 328 | 336 | 38 |
| 39 | 134 | 126 |  |  | 1038 |  |  |  |  | 29.06 |  |  |  |  |  | 9694 | 9778 | 986 |  |  | 39 |
| 40 | 8810 | 8733 | 865 | 8578 | 8500 | 8423 | 8345 | 8268 | 8190 | 29.8113 | $26^{5918}$ | 6005 | 6092 | 617 |  | 6353 | 6439 | 652 |  |  | 40 |
| 41 | 6280 | 6201 | 612 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 375 | 366 | 358 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 12 | 1138 | 105 |  |  |  | 07 |  |  | 32.047 | 28 |  |  | 6142 |  |  | 6422 | 6516 | 6609 |  | 43 |
| 44 | 8691 | 860 | 852 |  | 矿 | 8265 | 880 | 809 | 800 | ， | $29 \cdot 25$ | 260 | 27 | 279 |  |  |  | 317 | 327 |  | 44 |
| 45 | 6161 | 607 | 59 |  |  |  |  |  |  | 33.53 | 29.9 | 925 | 235 | 94 |  |  | 9744 | 9842 | 940 | ＋037 | 45 |
| 46 | 36 | 354 |  |  |  |  |  |  |  |  | 30.5806 |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 1102 |  |  |  |  |  |  |  |  |  | 31．2454 |  | 2658 |  |  |  | 砵 | 3168 | 270 | 372 | 47 |
| 48 | 857 | 847 | 838 |  |  | 8108 | 8015 | 79 | 782 | $35 \cdot 7735$ | 31.9 |  |  | 94 |  |  | 9727 | 983 |  |  | 48 |
| 49 | 604 | 594 |  |  |  |  |  |  |  |  | 32 |  |  | 606 |  |  | 6388 | 6495 | 660 |  | 49 |
| 50 | 3513 | 3416 | 331 | 3222 | 3126 | 3029 | 2932 | 2835 | 2738 | 37.264 | $33 \cdot 2398$ | 2507 | 2615 | 272 | 2832 | 29 | 3049 | 3158 | 326 | 337 | 50 |
| 51 | 0983 | 0884 |  | 0687 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 51 |
| 52 | 84 | 835 | 825 | 8151 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 52 |
| 53 | 5923 | 582 |  |  |  |  |  |  |  | ．5070 | 23 |  | 2572 | 26 |  |  | 3032 | 3147 | 3262 | 377 | 53 |
| 5 | 339 | 289 | 31 | 3080 | 2976 | 2871 | 276 | 26 | 2557 | $40 \cdot 2$ | 35．888 | 910 | 92 |  |  |  |  |  |  |  | 5 |
| 55 | 086 | 0757 | 06 |  |  |  | 022 |  | ＋012 | 40.990 | $36^{\circ}$ | 575 |  |  |  |  |  |  | 6593 | 671 | 5 |
| 56 | 833 | 82 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 56 |
|  |  |  |  |  |  |  |  |  |  | 42.4811 | 37.8934 |  | 9181 |  |  | 9553 | 967 | 980 |  |  | 57 |
| 58 | 32 | 31 | 305 | 2938 | 282 | 2713 | 2601 | 2489 | 76 | 43 | 38．55 | 57 | 583 |  |  |  | 63 |  |  |  | 58 |
| 5 |  |  |  |  |  |  |  |  |  | 43.97 | 39．2230 | 2358 | 2486 | 26 |  | 28 | 2998 | 312 |  |  | 59 |
| 60 | 8215 | 8099 | 7983 |  | 7751 |  | 7518 | 7402 | 7286 | 44.7169 | 39.8878 | 9008 | 138 | 926 | 939 | 52 | 965 | 978 |  | ＋05 | 60 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 31 | 303 | 2916 | 27 |  |  | 243 |  |  | $46 \cdot 20$ | 41.217 |  |  |  |  |  |  |  |  |  | 62 |
|  |  |  |  |  |  |  |  |  |  | 46.95 | 4 |  |  |  |  |  | 9642 |  |  |  | 63 |
|  |  |  |  |  |  |  |  | 72 |  | 47.69 | 42.5 |  |  |  |  |  |  |  |  |  | 64 |
| 65 | 556 | 544 | 5315 |  |  |  |  | 4685 | 4559 | 48.443 | 43.21 | 225 | 2400 | 25 |  | 2823 | 2964 | 10 |  |  | 65 |
|  |  |  |  |  |  |  |  |  | 2014 |  |  |  |  |  |  |  |  |  |  |  | 66 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 797 | 78 |  | 758 | 745 | 731 | 7187 | 705 | 692 | ．67 | 45.20 | 220 | 23 |  |  | 2800 |  |  |  |  | 68 |
|  | 54 | 531 |  | 50 | 4913 |  | 4646 |  | 4378 |  |  |  | 900 | 51 | 939 |  | 6 | 975 |  |  | 69 |
| 70 | 29 | 2782 |  |  |  |  |  |  |  | 52.16 | $46 \cdot 53$ |  | 566 |  | 596 | 611 | 626 | 642 | 65 |  | 70 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 78 | 771 | 758 | 7440 | 7301 | 7161 | 7022 | 688 | 6743 | 53.66 | $47 \cdot 86$ |  |  | 9122 |  |  |  | 974 |  |  | 72 |
|  | 53 | 5187 |  |  |  | 46 |  |  | 4 |  | 48.53 | d | 5618 | 517 | 59 | 2095 | 625 | 64 | 32 | 67 | 73 |
|  |  |  |  |  |  |  |  |  | 1652 | 55 | $49 \cdot 19$ | 2110 | 2270 | 2431 | 25 | 2752 | 2913 | 307 | 323 | 339 | 74 |
| 75 | 026 | ＋12 | 9979 | 9833 | 9688 | 9543 | 9398 | 9252 | 9107 | $55 \cdot 896$ | $49 \cdot 859$ | 8760 | 8923 |  | 9248 | 9411 |  | 9737 |  |  | 75 |
| 7 |  | 7592 | 7445 | 7298 |  |  |  |  | 6562 | 56.81 | 50.5 |  |  |  |  |  |  |  |  |  | 76 |
|  | 520 |  |  |  |  |  |  |  | 4017 | 57.386 |  | 270 | 227 |  | 25 | 2729 | 2896 | 砳 |  |  | 77 |
| 78 | 2680 | 252 | 2378 | 2227 | 2076 | 192 | 177 | 1623 | 1471 | 58．132 | 51.8541 | 87 | 888 | 90 | 92 | 9388 | 9557 | 972 | 989 | ＋0 | 78 |
| 79 | 115 |  |  |  | 188 |  | 9232 |  | 2926 | 877 | 52.5189 | 5360 | 553 | 578 | 5878 | 6047 | 6218 | 638 | 322 | 673 | 79 |
| 80 | 7620 |  |  |  |  | 684 | 6691 | 6536 | 6381 | 622 | $53 \cdot 183$ | 201 | 218 | 235 | 253 | 270 | 287 | 305 | 32 | 339 | 80 |
|  |  |  |  |  |  |  |  |  | 3836 | O |  | 866 | 883 |  |  | 3364 | 954 | 97 |  |  | 81 |
| 82 | 256 | 2402 | 2243 | 208 | 19 |  | 16 | 144 | 12 | 61.11 | 54.51 | 53 | 54 | 566 |  | 6023 | 620 | 637 | 655 |  | 82 |
| 8 | －03 | 极 | 97176 |  |  |  |  |  | 820 | 61－858 | $55^{\circ}$ | （ | 2141 | 232 |  | 2682 | 286 | 304 | 3222 |  | 83 |
|  | S 71 | 73 | 76 | 7013 | 6851 | 66 | 652 | 6363 | 620 | 62．603 | 55.8429 | 861 | 879 | 897 | 9158 | 9341 | 52 | 970 | 988 |  | 84 |
| 85 | 4971 | 48 | 4642 | 4478 | 4313 |  | 3984 | 3819 | 3655 | $63 \cdot 3490$ | 56.5077 | 5261 | 544 | 563 | 5815 |  | 618 |  |  |  | 85 |
|  | 244 | 22 | 2109 |  |  |  |  |  |  |  |  |  |  |  |  | 263 | 析 | ， |  |  | 86 |
| 8 | 9912 |  |  | 407 |  | ， | d |  | S 6 | 64 | 57•837 | 8561 | 870 | 5s | 57 |  |  |  |  |  |  |
|  | 7382 | 7212 | 7042 | 6871 | 6701 | 653 | 636 | 619 | 601 | $65^{\circ} 58$ | $58 \cdot 5020$ | 52 | 54 | 55 | 57 | 597 | 6167 | 635 | 654 | 673 | 88 |
| 8 | 485 | 4680 | 4508 | 336 | 4163 | 931 | 3819 | 546 | 3474 | 6.3301 | 59．1668 | 1862 | 205 | 22 | 24 | 2635 | 2828 | 302 | 32 |  | 89 |
| 90 | 2323 |  |  |  | 1626 | 1452 | 1277 | 1103 | 0928 | 67．0754 | 59.8316 | 8512 | 370 | 89 | 909 | 9294 | 9489 | 96 | 9879 | ＋074 | 90 |
|  | 9793 |  |  |  |  |  | 8736 | 8560 | 8383 | 67•820 | $60^{\circ}$ | 516 | 536 | 555 | 5755 | 5952 | 15 | 6347 | 6545 |  | 91 |
|  | 726 | 708 | 690 |  | 65 | 63 | 6195 | 6016 | 5838 | 68. | 61.16 | 18 | 2012 | 221 | 2411 | 2611 | 2811 | 3010 | 321 |  | 92 |
| 93 | 4733 | 4553 | 4374 | 93 | 2013 |  | ， | 3473 | 3293 | 69．311 | $61 \cdot 826$ | 84 |  |  |  | 9270 |  |  |  |  | 93 |
|  | 204 | 2022 | 1840 | 1658 | 147 | 129 | 1112 | 0930 | 0747 | 70．05 | 62＇4908 | 51 | 53 | 552 | 5725 | 5929 | 613 | 633 | 65 |  | 94 |
| 95 | 9674 | 949 | 9306 | 9122 | 8938 |  |  |  | 8202 | 81 | 63.155 |  | 1969 | 2175 |  | 258 | 2794 | 3000 | 320 |  | 95 |
|  | 714 | 6958 |  | 65 |  |  |  |  |  |  | 63•8204 |  | 析 | 830 | 535 | 24 | 4， | 9663 | 987 |  | 96 |
|  | 4614 | 4427 |  | 矿 | 析 | 1185 | 3488 | 3300 | 3112 | 72－292 | 64：4852 | 506 | 52 | 54 | 56 | 5905 | 6116 | 632 | 553 | 674 | 97 |
|  |  | 1895 |  |  | 132 | 113 | 0946 | 0757 | 05 | 73.037 | 65 | 171 | 1926 | 213 | 2351 | 2564 | 2777 | 298 | 320 |  | 98 |
| 99 | 9555 | 9363 | 172 |  | 8788 | 859 | 8405 | 8213 | 8021 | $73 \cdot 7829$ | 65.148 | 硣 |  |  |  |  |  |  |  |  |  |
| 100 | 7025 | 6832 | 6638 | 6445 | 6251 | 6057 | 5864 | 5670 | 5476 | 74．5282 | 66.4796 | 5013 | 5230 | 5448 | 5665 | 5882 | 6099 | 6316 | 6533 | 6749 | 100 |
|  | $20^{\prime}$ | $19^{\prime}$ | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime \prime}$ | 15 | $14^{\prime}$ | ｜ $13^{\prime}$ | $12^{\prime}$ |  | $20^{\prime}$ | $19^{\prime}$ |  | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | $14^{\prime}$ |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 41 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $41^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | 52 | 53 | $54^{\prime}$ | $55^{\prime}$ | $56^{\prime}$ | $57^{\prime}$ | $58^{\prime}$ | $69^{\prime}$ | 50 | 51 | $52^{\prime}$ | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ |  | 57 |  |  |  |
|  | 745 | 744 | 744 | 74 | 74 | 744 | 743 | 7437 | 743 | 7433 | ${ }^{\circ} 6670$ | 6672 | 6674 | 6576 | 6678 | 6680 | 6683 | 6685 | 6687 | 6689 |  |
|  |  |  | 48 |  | 4886 | 48 | 4878 | 4875 | 487 |  | 33 | 33 | 3348 | 3352 | 3357 | 3361 | 3365 | 3370 | 337 | 337 |  |
|  | 2353 | 2347 | 234 | 233 | 232 | 232 | 2318 | 2312 | 2306 | 2.23 | ， | 001 | 0022 | 0028 | 0035 | 0041 | 0048 | 0054 | 0061 |  |  |
|  | 980 | 97 |  |  |  |  |  |  |  | ． 973 | ． 66 | 668 | 6696 | 67 | 6713 | 6722 | 6731 | 6739 | 6748 |  |  |
| 5 | 7254 |  |  |  |  |  |  |  |  |  | 3.3348 | 3359 | 3370 | 338 | 339 | 340 | 341 | 342 | 343 | 3446 |  |
| 6 | 47 | 4694 | 4682 | 4670 | 4659 |  | 4635 | 4624 | 4612 | 4460 | ． 0018 | 0031 | 0044 | 0057 | 007 | 008 | 0096 | 0109 | 0122 |  |  |
| 7 | 215 | 2143 | 2129 | 2715 | 210 | 2088 |  |  |  |  |  | 67 | 67 | 67 | 67 | 6763 | 6779 | 6794 | 6809 |  |  |
|  | 96 | 9592 | 9576 |  |  |  | 95 | 9498 | 948 |  | $5 \cdot 3357$ | 33 | 3392 | 34 | 105 | 3444 | 3461 | 3479 | 3496 | 3513 |  |
|  | 7058 | 704 |  | 7006 | 648 | 6971 | 69 | 6936 | 69 |  | － 327 | 0046 | 0066 | 00 | 0105 | 0124 | 0144 | 0163 | 0183 |  |  |
| 10 | 4509 | 4489 | 447 | 445 | 4431 | 4412 | 4 |  | 4353 | 433 | 6697 | 6718 | 67 | 6762 | 6783 | 6805 | 6827 | 6848 | 6870 | 892 | 10 |
| 11 | 1960 | 193 |  |  |  |  |  |  |  |  |  | 339 |  |  | 3462 | 3485 | 3509 | 3533 |  |  | 11 |
| 12 | 9411 | 387 | 9364 |  |  |  |  | 9247 | 922 |  |  | 062 |  |  |  | 0166 | O192 | 0218 | 0244 | 02 | 12 |
| ， | 6861 | 6836 | 681 | 6786 | 676 | 6735 | 6710 | 6685 | 603 | ． 66 | 8.6706 | 67 | 67 | 67 | 68 | 6846 | 6875 | 6903 | 6931 |  | 13 |
| 14 | 43 |  | 42 | 423 |  | 4176 | 4149 | 4122 | 409 | 10.4 | 9.3375 | 3406 | 34 | 34 | 3497 | 3527 | 355 | 358 | 3618 | 3648 | 14 |
| 15 | 17 | 1734 | 1705 | 1676 | 1647 | 1618 | 1588 | 1559 | 1530 | 11. | 10.0045 | 077 | 011 | 01 | 017 | 020 | 02 | 027 | 0305 | 0337 | 15 |
| 16 | 92 | 9183 | 9152 | 91 | 9090 | 9059 | 9028 | 8997 | 8965 | 11 | $10^{\circ}$ | 6749 | 67 | 68 | 68 | 6888 | 6922 | 6957 | 6992 |  | 16 |
| 17 | 6665 | 6632 | 659 |  |  |  |  | 6434 | 6401 | 12.636 | 11.3384 | 3421 | 34 | 3495 | 353 | 58 | 360 | 3642 | 3679 |  | 17 |
| 18 | 41 | 4081 | 4046 | 401 | 3976 |  | 3906 | 38 | 3836 | ＇380 | 12.00 | 00 | 013 | 01 | 02 | 0249 | 0288 | 032 | 0366 | 0405 | 18 |
| 19 | 15 | 153 |  |  |  |  |  | 1308 |  | 14.12 | 12.6724 |  |  |  |  | 692 | 697 | 701 | 7053 |  | 19 |
| 20 | 9018 |  |  |  |  |  |  |  |  |  |  |  |  |  | 567 |  | 65 | 3696 | 37 | 378 | 20 |
| 21 | 6469 |  | 6387 |  |  |  |  | 6183 | 6142 | 15.610 | 14.0063 | 0108 | 0154 | 0199 | 0245 | 0290 | 0336 | 038 |  |  | 21 |
| 22 | 3919 | 387 | 3834 | 37 | 3749 |  |  | 3620 | 35 | 16.3 | 14 |  | 6828 |  |  |  | 70 |  |  |  | 22 |
| 23 | 137 | 13 | 128 |  |  |  |  | 1058 | 1013 | ． 09 | 15.3402 | 34 | 3502 | 355 |  | 3651 | 3701 | 3751 | 3801 |  | 23 |
| 24 | 882 | 8775 |  |  |  |  |  | 8495 | 448 | 17 | 16 | 01 | 01 | 022 | 0280 | 0332 | 038 | 043 | 0488 | 0539 | 24 |
| 25 | 6272 | 622 | 6175 | 6126 | 6078 | 6029 |  | 5932 | 5884 | 18.5835 | $16 \cdot 6742$ | 679 | 685 | 6904 | 695 | 701 | 206 | 712 | 7175 | 7229 | 25 |
| 26 | 3723 | 3672 | 36 | 3572 | 3521 | 3470 | 3420 | 3369 | 3319 | 19.3268 | $17 \cdot 3411$ | 3468 | 3524 | 3580 | 3636 | 3693 |  |  |  |  | 26 |
| 27 | 11 |  |  |  |  | 0912 |  |  |  | 20.070 | 18.008 |  |  |  | 0315 | 037 | 71 | 049 |  |  | 27 |
| 28 | 8625 | 857 | 8516 | 8462 | 8407 | 8353 | 8298 | 82 | 8190 | $20 \cdot 8$ | 18.67 | 68 |  | 69 |  | 705 | 71 | 717 | 7235 |  | 28 |
| 29 | 60 |  |  |  |  |  |  |  |  | 21.556 | 342 | 34 | 35 | 3609 | 367 | 373 | 379 | 3860 | 3922 |  | 2 |
| 30 | 3526 |  |  |  |  |  |  | 3119 |  |  | 20.0090 | 01 | 02 | 028 | 035 |  | 048 | 054 | 0609 | 067 | 30 |
| 31 | 0977 |  |  |  |  |  |  |  |  | 23.043 | 20．6759 | 6827 | 6894 | 6961 | 7028 | 7095 | 7162 | 722 | 7296 |  | 31 |
| 32 | 842 | 8366 | 830 | 824 | 8180 | 8118 |  |  | 793 | $23 \cdot 7$ | 21．34 |  |  |  |  | 3776 |  |  |  |  | 32 |
| 33 | 587 |  |  |  |  |  |  |  |  | 24.5302 |  | 0170 | 0242 | 031 | 03 | 0456 | 052 | 0599 | 0670 |  | 33 |
| 34 | 3330 | 326 | 319 | 313 | 3066 | 3000 | 2934 | 2868 | 2802 | 25.273 | $22 \cdot 676$ | 6842 | 6916 | 698 | 7063 | 7137 | 721 | 72 | 7357 |  |  |
| 35 | 0781 | 0713 | 06 | 0577 |  |  | 0373 | 0305 | 023 | 26.0169 | 23 | 35 | 35 | 36 | 3741 | 3817 | 38 | 3969 | 4044 | 4120 | 35 |
| 36 | 8232 | 8162 | 8092 | 8022 |  | 7882 |  |  |  | $26 \cdot 760$ | 24.010 |  |  |  |  |  |  |  |  |  | 36 |
| 37 | 5683 |  |  |  |  |  | 525 |  |  | 2 | $24 \cdot 67$ |  |  |  |  |  | 725 |  |  |  |  |
| 38 | 313 | 30 | 2986 | 2912 |  | 2765 | 2691 | 2617 | 2543 | 28 | $25 \cdot 344$ | 3529 | 3612 | 3694 | 3776 | 3859 | 3941 | 4023 | 4105 | 4187 | 38 |
| 39 |  |  |  |  |  | 0206 | 0130 |  | 9978 | 28 | 26.0117 |  |  | 0370 | 04 | 0539 | 0624 |  | 792 |  | 39 |
| 40 | 803 |  |  |  | 7725 |  |  |  | 7414 | $29 \cdot 7336$ | 26.6786 | 6873 | 6960 | 7046 | 7133 | 722 | 7306 | 739 | 747 | 756 | 40 |
| 41 | 5486 |  | 532 |  |  |  |  |  |  | $30 \cdot 476$ | 27.345 |  | 3634 | 3723 |  |  |  |  |  |  |  |
| 42 | 293 | 2856 | 277 |  |  |  |  | 2366 | 2284 | 31.2203 |  | 02 | 03 | 03 | 990 | 05 |  |  |  |  | 42 |
|  | 03 | 0304 |  |  |  | 9970 | 988 |  |  | 31．9636 | 28 |  |  |  |  | 726 |  |  |  |  | 43 |
| 44 | 783 | 77 |  |  |  |  |  |  | 7155 | $32 \cdot 7069$ |  | 3560 | 3656 |  |  | 3942 |  | 4132 |  |  | 44 |
| 45 | 5290 | 52 | 5115 |  |  | 4853 |  | 4678 | 4590 | 33 | 30 | 0232 | 0330 | 0427 | 0525 | 0622 | 0719 | 8817 | 0914 | 101 | 45 |
| 46 | 2741 | 265 | 2562 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 46 |
| 4 | 0191 | 0100 |  |  |  | 973 |  |  |  | 34.9370 | 31 |  |  |  |  |  | 40 | 41 |  |  | 47 |
| 48 | 76 |  |  |  |  |  |  |  | 6896 | 35.6803 | 32 |  | 0352 | 04 | 0560 |  |  |  |  |  | 48 |
| 49 | 50 |  |  |  |  | 7617 | 4522 | 4427 | 4332 | 36.4236 | 32 | 6920 | 7026 |  |  | 73 | 7450 | 8581 | 766 | 776 | 49 |
| 50 | 25 | 2447 | 2350 | 2253 | 2156 |  |  | 1864 | 1767 | 37. | 33．3483 |  | 3700 | 380 | 3916 | 402 | 413 | 424 | 4349 | 445 | 50 |
| 51 | 999 |  | 979 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 744 | 7345 | 72 |  |  |  |  |  |  | 38.6536 |  |  |  |  | 7273 |  |  |  |  |  |  |
| 53 | 489 | 4794 | 46 |  | 4485 | 4382 | 4279 | 417 | 407 | $39 \cdot 39$ | 35 | 36 | 3722 | 383 | 3951 | 406 | 418 | 42 | 4410 |  |  |
| 54 | 23 |  |  |  |  | 182 |  | 161 | 150 | 40．14 |  |  | 0396 |  | 0630 | 07 |  |  | 1097 |  |  |
| 55 | 9798 | 9692 | 9585 |  | 9371 | 9265 | 9158 |  |  | $0 \cdot 88$ | 36.6831 | 6951 | 7070 |  | 7308 |  |  | 7665 | 7784 |  | 55 |
| 56 | 7249 | 7141 | 7032 |  | 6814 |  |  |  |  | $41 \cdot 6270$ | $37 \cdot 35$ |  |  |  |  |  |  |  |  |  |  |
| 57 | 4700 | 45 | 44 |  | 58 | 4147 | 40 |  | 381 | $42 \cdot 370$ | $38^{\circ}$ |  |  |  |  |  |  |  |  |  |  |
| 58 | 2151 | 20 |  |  |  |  |  |  | 1250 | 43.11 | $38^{\circ} 68$ |  | 7092 | 721 | 7343 | 746 | 7594 |  |  |  |  |
| 59 | 9602 | 9488 | 9373 |  | 9144 | 29 | 8915 | 880 | 8685 | 43.857 | $39 \cdot$ | 3638 | 3766 | 3893 | 4021 | 414 | 427 | 4404 | 4532 | 465 |  |
| 60 | 7053 | 693 | 6820 | 6703 | 658 | 6470 | 6354 | 6237 | 612 | $44^{\circ} 6$ | 40.018 | 031 | 0440 | 5 |  |  |  | 1089 | 1219 |  | 60 |
| 61 | 45 | 438 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | ． 35 |  |  |  |  |  |  |  |  |  |  |
| 63 | 940 | 928 | 91 | 9039 | 8916 | 87 | 867 | 85 | 8426 | 6.83 | 42.01 | 03 | 046 | 059 | 07 |  |  |  |  |  |  |
| 64 | 685 | 673 |  |  |  |  |  |  |  | ． 57 |  |  |  | 727 |  | 75 | 7690 | 782 | 7967 |  |  |
| 65 | 430 |  |  |  |  |  |  |  |  | 4831 |  |  |  |  |  |  | 437 | 451 | 66 | 479 | 65 |
| 66 | 175 |  |  |  |  |  |  |  |  |  |  |  |  | 062 |  |  | 1055 |  | 1341 |  |  |
| 67 | 9208 | 90 | 8949 | 8819 |  |  | 8428 |  | 816 | 9．8037 | $44^{\circ} 68$ | 70 |  | 7303 |  |  |  |  |  |  |  |
| 68 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 69 | 411 | 397 | 3843 | 3709 | 3575 | 344 | 330 | 317 | 3038 | 51.29 | 46.02 | 035 | 0506 | 065 | 08 | 095 | 11 | 125 | 1402 | 155 |  |
| 70 | 156 | 1426 | 12 | 1154 | 1018 | 砛 | 0746 |  | 0474 | 52.033 | $46 \cdot 687$ | 7028 | 180 | 73. | 左 | ， | 778 | 7937 | ， | 824 | 70 |
| 71 | 90 | 887 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 64 | 632 |  |  |  |  |  |  |  |  | 48 | － | 052 | 068 | 0839 | 09 | 115 | 1307 | 1463 |  |  |
| 73 | 391 | 3773 | 36 | 3489 | 3347 | 3206 | 3064 | 2922 | 2780 | 54.263 | $48^{\circ} 68$ | 7043 | 7202 | 7360 | 7518 | 7676 | 7834 | 7997 | 815 | 83 |  |
| 74 | 136 |  |  |  |  |  |  |  | ， | ．0071 | ． 35 | 保 | 5056 | 4 | 418 | 435 | 116 | 467 | 483 |  |  |
| 75 | 8816 | 867 | 25 | 8379 | 234 | 808 | 7942 | 7796 | 7651 | 55.750 | 50.02 | 038 | 055 | 071 | 087 | 103 | 119 | 136 | 152 | 168 |  |
| 76 | 6267 | 6120 | 5972 | 5824 | 5677 | 5529 | 5381 | 5234 | 086 | 56．493 | 50．68 | 705 | 7224 | 738 | 755 | 7717 | 788 | 8046 | 8211 |  |  |
| 77 | 3718 | 3568 | 3419 |  | 矿 |  |  |  | 2521 | 57－237 | 51 | 373 | 3898 | 406 | 4231 | 278 | 矿 | 4731 |  |  |  |
| 78 | 16 | 1017 |  |  |  |  |  |  | 957 | 57－98 | 52.02 | 0403 | 0572 | 074 | 0909 | 107 | 124 | 1416 | 1585 | 175 | 78 |
| 79 | 862 | 8466 | 8313 | 8160 | 8006 | 7853 | 7699 | 7546 | 7392 | 58.723 | 52．6903 | 707 | 7246 | 741 | 75 | 77 | 79 | 810 | 827 | 844 |  |
| 80 | 6070 | 5915 |  |  |  |  |  |  | 4827 | $5 \cdot 4672$ |  | 374 |  | 4093 |  | 443 |  | 4785 | 4958 | ， | 80 |
| 81 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 155 |  |  |  |
| 82 | 0972 | 0813 | 0654 | 0495 | 0335 | 0176 | ＋017 | 9857 | 9698 | 60．9538 | 54．691 | 7090 | 7268 | 74 | 762 | 78 | 797 | 8155 | 8332 | 851 | 82 |
| 83 | 8423 | 8262 | 810 | 7940 | 左 | 7617 | 456 | 7295 | 7133 | 61.6972 | $55 \cdot 3582$ | 3762 | 3942 | 412 | 4301 | 448 | 466 | 4840 | 5019 |  |  |
| 8 | 5 | 1. |  |  | 5222 | 5059 | 4895 | 析 | 569 | $62 \cdot 44$ | 56.0252 |  | 0615 | 0797 | 0979 | 1161 | 1343 | 1525 | 1706 | 188 | 84 |
| 85 | 3325 | 3160 | 2995 | 2830 | 2665 | 2500 | 2334 | 2169 | 2004 | $63 \cdot 183$ | $56 \cdot 6921$ | 710 | 7289 | 747 | 7658 | 7842 | 8026 | 21 | ｜ 8393 | 857 |  |
| 86 | 077 | 09 | 0442 | 0275 | 1108 | 9941 | 9774 | 9607 | 439 | ．92 | 57．359 | 3777 | 3963 | 415 | 4336 | 4522 | 4708 | 4894 | 5080 |  |  |
| 87 | 8227 | 58 |  |  | 㖪 | 仡 |  | 804 | 6875 |  | 58.02 | 244 | 2637 | 852 | 1014 | 20 | 391 | 1579 | 176 | ， |  |
| 88 | 5678 | 5507 | 5336 | 5165 | 4994 | 4823 | 4652 | 4481 | 4310 | 65.4139 | 58.6930 | 7121 | 7311 | 750 | 769 | 7883 | 8074 | 8264 | 845 | 864 |  |
| 89 | 3128 | 56 |  |  | 37 | 64 | 91 | 188 | 745 | 66.1572 | 59．3600 | 3793 | 3985 | 4178 | 437 | 4564 | 4756 | 494 | 14 | 533 |  |
| 90 | 057 |  | 0230 | ＋055 | 9880 | 9706 | 9531 | 9356 | 9181 | $66 \cdot 9005$ | 02 | 0465 | 065 | 0854 | 1049 | 1244 | 1439 | 163 | 1828 | 202 | 90 |
| 91 | 8030 | 54 |  | 研 | 7323 | 714 | 6970 |  | 6616 |  |  | 矿 | 7333 | 753 | 728 | 7925 | 8122 | 831 | 851 | 硣 |  |
| 92 | 5481 | 5303 | 5124 | 4945 | 476 | 4588 | 440 | 4230 | 4051 | 68.387 | 61．36 | 380 | 400 | 42 | 44 | 46 | 4804 | 500 | 520 | 54 | 92 |
| 93 | 2932 | 523 | 257 |  | 218 | 2070 |  |  | 487 | 69836 | 62.227 | 0480 | 0681 | 8883 | 776 | 7286 | 1487 | 1688 | 1887 | 201 | 93 |
| 94 | 0383 | 0200 | 018 | 9835 | 965 | 947 | 928 | 9105 | 8922 | 69－873 | 62.6948 | 7152 | 735 | 755 | 776 | 7966 | 8170 | 837 | 857 |  |  |
| 95 | 78 | 7649 |  | 7281 |  | 6911 | 6727 | 6542 | 6357 | 70．6172 | $63 \cdot 3618$ | 382 | 4029 | 4235 | 4441 | 4647 | 4852 | 5058 | 5263 |  | 95 |
| 96 | 5285 |  |  |  |  | 179 |  |  | 3793 |  |  |  |  |  | ${ }^{11119}$ | 108 | 535 | 174 | 183 |  |  |
| 97 | 2735 | 2547 | 23 | 2171 | 198 | 1794 | ， 6 | 147 | 1228 | 72103 | 64.6957 | 716 | 737 | 7588 | 7118 | 80 | 8218 | 8427 | 8637 | 884 |  |
| 98 | ＋186 | 9996 | 98 | 9616 | 942 | 9235 | 9044 | 8854 | 8663 | 72.8473 | $65 \cdot 3627$ | 3839 | 4051 | 426 | 447 | 4688 | 4900 | 5112 | 532 | 553 |  |
|  | 7637 |  |  | 96 | ¢36 | 667 | 6932 | 629 | 6699 | 73.590 | 66.0296 | 511 | 2725 | 9616 | 1 | 136 | 1583 | 1797 | 209 | 源 |  |
| 100 | 5088 | 94 | 4700 | 4506 | 4312 | 4117 | 3923 | 3729 | 3534 | 74：333 | $66 \cdot 6966$ | 7183 | 7399 | 7616 | 833 | 8049 | 8266 | 8482 | 8698 | 914 | 100 |
|  | I0＇ | $9^{\prime}$ | $8^{\prime}$ | 7 | $16^{\prime}$ | $\bigcirc$ | $4^{\prime}$ | $3^{\prime}$ |  | $1^{1}$ | 10 | ［ $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | 5 | $4^{\prime}$ | $3^{\prime \prime}$ | $2^{\prime}$ | $1^{\prime}$ |  |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | INE． |  |  |  |  |  |

TRAVERSE TABLES．

| $42^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $42^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 0 | $1^{\prime}$ | $2^{\prime}$ | $3^{\prime}$ | T | ， | $6^{\prime}$ | $7^{\prime}$ | $8^{\prime}$ |  |  |  |  |  | ， | $5^{\prime}$ | $6^{\prime \prime}$ |  |  |  |  |
|  |  |  |  | 7426 |  |  |  | 418 | 7416 |  |  | 693 |  |  |  |  |  |  |  |  |  |
|  | T | 4859 | 485 | 48 | ${ }_{4847}$ | 4843 | 4840 | 4836 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2294 | 22 | 228 | 2277 | 227 | 2265 | 2259 | 2253 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9726 | 97 | 9710 | 9702 | 269 | 9687 | 9679 | 96 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 7148 | 7138 | 7128 |  |  |  |  |  | $3{ }^{4} 7$ | 3．34 |  |  | 3489 |  | 3511 |  | 3532 |  |  |  |
| 6 | 4589 | 4577 | 4565 | 14554 | 4542 | 4530 | 4519 | 4507 | 4495 | 4.4 | $4.0148{ }^{0}$ | 61 | 0174 | 0187 | 0200 | 0213 | 0226 | 0239 | 0251 | 0264 |  |
|  |  |  |  |  |  | H32 | 1938 |  | ， |  |  | 6854 | 6869 | 6885 |  |  | 693 |  |  |  |  |
|  |  |  |  | 9405 |  | 9374 | 9358 | 93 | 9327 | 5.931 | 5.3530 | 3548 | 3565 | 3582 | 3600 | 3617 | 363 | 36 | 3669 |  |  |
|  |  |  |  | 6830 |  | 67 | 671 |  | 6743 | 6．672 | － | 0241 | 0261 |  |  | 0319 | 033 | 0358 |  |  |  |
| 10 | 4314 |  |  | 4256 |  |  |  | 4178 | 4159 | 7.413 | 6.6913 | 6935 | 6956 | 6978 | 6999 | ） | 70 | 706 | 7086 |  |  |
| 11 | 1746 |  |  |  |  |  |  |  |  | 8.155 | $7 \cdot 3604$ | 3628 | 665 | 3676 | 369 | ${ }^{3723}$ | 3747 | 3771 |  |  |  |
| $12$ |  | 91 | 91 |  |  |  |  | 9014 | 899 |  |  | 0322 | O348 | 0373 | 0399 |  |  |  |  |  | 2 |
| $13$ | 6609 |  | 65 | 6533 |  | 6482 | 64 |  |  |  |  | 7015 |  |  |  |  |  |  |  |  | 3 |
| 14 | 402 | 4013 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 1472 |  | 1413 |  |  |  |  |  |  | 117209 |  | 0402 |  |  | 0499 | 0532 | 0564 | 0596 |  |  |  |
| 16 | 89 | 88 | 88 | 8810 | 8779 | 8747 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 17 | 633 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 18 |
| 18 |  |  |  | 3661 | 3626 | 3591 | 35 | 3521 | 3485 0901 | 13.3 14.0 | 12 | ${ }^{0482}$ | 0521 |  |  |  |  |  |  |  | 18 19 |
| 20 | 86 | 85 | 85 | 85 | 84 | 84 | 839 | 8356 | 8317 | 14.827 | 13.3826 | 38 | ${ }_{3913}$ | 3956 | 399 | ${ }_{404}^{734}$ | 408 | 412 | $\left.\right\|_{4172} ^{7465}$ |  |  |
| 21 |  |  |  |  |  | 5856 |  |  | 573 | $15^{\circ}$ | 14. | 0563 | 0608 | ${ }^{06}$ | 069 | 074 | 079 | 083 | 0880 |  | 21 |
| 22 |  | 34 |  |  |  | 32 | 32 |  | 31 | $16^{\prime}$ |  |  |  | 735 |  |  |  |  |  |  |  |
|  |  |  |  | 0789 | 0744 | O6 |  |  |  |  |  |  |  | 404 |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7607 | 7661 | 7715 |  |  |
| 26 | 321 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 27 |  | 0597 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | 808 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 28 |
| 29 |  |  |  |  |  |  |  |  |  |  | 19.4048 | － |  | 4236 |  | 436 | 442 | ${ }^{4486}$ |  |  | 29 |
| 30 | 29 | 2885 | 2827 | 2768 | 2710 | 2651 | 2593 | 2534 | 2476 | 22.2417 | 20.0739 | 280， | 086 | 093 |  |  | 112 |  |  |  |  |
| 31 | 03 | 0315 | ${ }^{0254}$ | 0194 |  |  | ＊012 |  | 989 |  | 20.7 | 749 | 756 |  |  | 776 |  |  |  |  | 31 |
| 32 |  |  |  |  |  |  |  |  |  | 23.7 |  | 419 |  |  |  | 44 |  |  |  |  |  |
|  |  |  |  |  |  | 4916 | 4852 | 478 | 47 | 24 |  |  |  |  |  |  |  |  |  |  |  |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  | 76 |  |  |  |  |  |  |  | 34 |
| 35 | 0101 | 10 |  |  |  |  |  |  |  | 25.94 |  |  | 431 | 44 |  | 4574 | 4649 |  |  |  |  |
| 36 |  |  |  |  |  |  |  |  |  |  | $24^{\circ} \mathrm{O}$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 4747 | 4675 | 46 | 45 | $4{ }^{4}$ | 438 | $27 \cdot 43$ | 24 |  |  |  |  |  |  |  |  |  |  |
| 38 | 23 | 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 2 | 71 | 7102 | 7024 |  |  | 6790 | 671 | 663 | $29 \cdot 655$ | $26 \cdot 7652$ |  |  |  |  |  |  |  |  |  |  |
| 41 | 468 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $42$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 955 | 96 | 9385 |  |  | 91 | 9050 |  |  |  |  |  |  |  |  |  |  | 8376 |  |  |  |
|  |  |  |  |  |  |  | 64 |  |  |  |  | 451 | 46 | 47 | 有 |  |  |  |  |  | 45 |
| 45 | 44 | 432 | 42 | 4152 | 4065 | 3977 | 388 |  |  | 33＇36 | $30^{\circ}$ | 120 | 130 | 140 | 14 | 15 | 169 | 178 | 18 |  |  |
| 46 | 18 |  |  | 1578 |  |  | 13 | 1219 |  | 34．10 | $30 \cdot 7$ |  |  |  |  |  |  |  |  |  | 46 |
|  |  |  |  |  |  |  | 8729 | 8637 |  |  | 31.4 |  |  | 479 |  |  |  |  |  |  |  |
| 48 | 67 |  |  |  |  |  | 61 | 6055 |  |  | 32 |  |  |  |  |  |  |  |  |  |  |
| 50 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9 |
| 50 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $51$ | 6435 | 63 | $\begin{aligned} & 8805 \\ & 6233 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 3867 |  |  |  |  | 33 | 32 |  |  | 39.293 | 35 | 45 |  |  |  | 521 | 532 |  |  |  |  |
| 5 | 1298 | T |  |  |  |  |  |  |  | 40.03 | 36．13 |  |  | －378 |  | 1816 |  |  |  |  |  |
| 55 | 8730 | 862 | 85 | 8408 | 8301 | 81 | 8087 |  | 787 | 40.77 | 36•802 | 814 | 82 | 837 |  | 861 | 8735 |  | 8972 |  | 55 |
| 56 | 616 | 6052 |  |  |  |  |  |  |  | 41.51 | $37 \cdot 47$ | 析 |  |  |  | 531 |  |  |  |  | 56 |
|  |  |  |  |  |  |  |  |  |  | $42^{2}$ |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 818 |  |  |  |  |  |  | 7322 |  | 46 | 42.15 |  |  |  |  |  |  |  |  |  |  |
| 64 |  |  |  |  |  |  |  |  | 461 | 47 | $42^{\prime} 8$ |  |  |  |  |  | 9073 | 921 |  |  |  |
| 65 | 3044 | 2918 | 2791 |  | 2538 | 241 | 228 | 2158 | 20 | $4{ }^{4} 19$ | 43.49 |  |  |  |  |  |  |  |  |  | 55 |
|  | 047 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
| 67 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 50 |  |  |  |  |  | 5743 |  |  |  |  |  |
| \％ |  |  |  |  |  |  | 1963 | 182 | 91 | 51. | $46^{46} 1$ |  |  |  |  |  |  |  |  |  | 69 |
| 71 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5850 |  |  |  |  |  |
|  |  |  |  |  | 45 |  |  |  |  |  |  |  |  |  | 239 | 25 |  |  |  |  |  |
| 73 | 2496 |  | 2211 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 74 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7359 | 7213 |  |  |  |  |  | 硣 | dras | 位 | 50．18 | 20 |  |  |  | 2658 |  |  |  |  | 75 |
|  | 479 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 222 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 77 |
| 78 |  |  |  |  |  | 63 |  |  | 5853 | 58.56 | 52.86 | 878 | ${ }_{8}^{295}$ | 918 |  |  |  |  |  |  |  |
| 80 | 4516 | 4360 | 4204 | 4048 | 3893 | 3737 | 358 | 3425 | 3269 | 59：311 | 53.530 | 5477 | 5650 | 5823 | 5996 | 6169 | 6341 |  |  |  |  |
| 81 | 1947 |  |  |  |  |  |  |  | 0684 |  |  |  | 2346 | 2521 | 2696 | 2871 |  | ${ }^{3220}$ |  |  |  |
|  | 937 | 9219 | 905 | 8900 |  |  |  |  | 81 | 60 | 54：8678 |  |  |  |  |  |  |  | 110 |  |  |
| 83 | 68 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 84 <br> 85 <br> 8 | ${ }_{1673}{ }^{424}$ |  |  |  |  | 08 | 067 | 05 | 0348 | 63.01 | 56．87 | 894 | 91 | 93 | 949 | 967 | 9863 | 334 | 02 |  |  |
| 86 | 9105 |  |  |  |  |  |  | 7931 |  | 63 | 57 |  | 5824 | 6010 |  |  | 6567 |  |  |  |  |
| 87 | 65 | 6367 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 398 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 888 |
| 90 | 8830 | 8655 | 8480 | 8305 | 8129 | 795 | 7778 | 7603 | 7427 | 66725 | $60 \cdot 22$ | 2412 | 2607 | 281 | 2995 | 319 | 380 | 357 | 3772 |  | 90 |
|  | 62 |  |  |  |  |  |  |  |  |  | 60 |  |  |  |  |  |  |  |  |  |  |
|  | 3693 | 3514 | 3335 | 3156 | 2977 | $7279$ | 2618 | 2438 | 2259 | 68.94 | 61.56 | 579 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | ${ }_{764} 021$ |  | 78 | ${ }_{7} 969$ | 68.94 69.69 | 62.229 62.8983 | ${ }_{218}^{248}$ | ${ }_{938}^{269}$ |  |  |  |  |  |  |  |  |
| 94 | 59 |  |  | 5433 | ${ }_{5248}$ | 506 | 487 | 4692 | 450 | 70＊432 | 63：567 | 48 |  | 62 | 649 | 670 | 690 | 71 | 731 |  |  |
|  | 34 |  |  |  |  |  |  |  | 192 |  |  |  |  |  |  |  | 3610 |  | 402 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | ${ }^{4362}$ | 171 | 197 | 781 | 4170 | 7413 | 66．913 | 34 | 956 | 9779 | 9995 | 2II | 0427 | 064 | 85 | 1074 | 100 |
|  |  | 995 | 755 | 2561 | $56^{\prime}$ | ${ }^{515}$ | $54^{\prime}$ | 153＇ | $52^{\prime}$ | $51^{\prime}$ |  |  |  | $57^{\prime}$ | $56^{\circ}$ | 55 |  |  |  | $51^{7}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 4 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $42^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $11^{\prime}$ | $12^{\prime}$ | $13^{\prime}$ | I＇ | $15^{\prime}$ | $16^{\prime}$ | $17^{\prime}$ | $18^{\prime}$ | $19^{\prime}$ |  | 11 | 12 |  | $14^{\prime}$ | 15 |  | $17^{\prime}$ |  |  |  |
|  | 7412 | 741 | 740 | 740 | 7404 | 7402 | 74 | 7398 | 73 |  | 713 | 6715 | 67 | 67 | 672 | 672 | 6726 | 6728 | 6730 | 6732 |  |
|  | 48 | 4820 | 4816 | 4812 | 4808 | 4804 | 4800 |  |  | $1 \cdot 47$ | 1.3426 | 3430 | 3434 | 3439 | 3443 | 3447 | 3452 | 3456 | 3460 | 3465 |  |
|  | 2236 | 2230 | 2224 | 221 | 2212 | 2207 | 2201 |  | 2189 | 2 |  | 014 | 0152 | 0 | 0165 | 0171 | 0177 | 018 | 019 | 019 |  |
|  | 9648 | 9640 | 9632 | 9624 | 9617 |  |  |  |  |  |  |  |  | 68 | 6886 | 689 | 6903 | 6912 | 6921 | 6929 |  |
| 5 | 7060 |  |  |  |  |  |  |  |  |  |  |  | 3586 | 3597 | 68 | 3618 | 3629 | 364 | 3651 |  | 5 |
| 6 | 447 | 4460 | 4448 | 4437 | 4425 | 4413 | 4401 | 4390 | 4378 | 4.4366 | 4.0277 | 0290 | 0303 | 0316 | 0329 | 0342 | 0355 | 0368 | 0381 |  |  |
|  | 1884 | 187 |  |  | 1829 | 1815 | 1802 | 1788 |  |  |  | 70 |  |  |  |  | 708 | 708 |  |  |  |
|  | 9296 | 9280 |  |  |  | 9217 | 9202 |  |  |  |  |  |  |  |  |  | 3807 |  |  |  |  |
|  | 6708 |  |  |  |  |  |  | 6584 |  |  |  |  |  |  |  |  |  | 055 | 057 | 059 |  |
| 10 | 4120 | 4， | 4080 | 40 | 4041 | 4022 | 4002 | 3983 | 3963 | \％ |  | 1 | ， | ， | 215 | 23 | 矿 | 7280 | 7301 |  | 10 |
| 11 | 153 | 151 | 148 |  | 1446 | 142 |  |  |  | 8．1338 | 73842 | 3866 |  |  |  |  |  |  |  |  | 1 |
| 12 | 894 |  |  |  |  | 8826 | 8803 | 8779 |  |  | 5 | 05 |  |  | 0658 |  |  | 0736 |  |  | 12 |
| 13 | 635 | 6330 | 63 | 62 | 6254 | 6228 | 62 | 6177 | 61 | 9.612 | 7268 | 729 | 732 | 735 | 7380 | 7408 | 743 | 7464 | 742 | 75 | 3 |
| 14 | 376 |  |  |  |  | ） |  |  |  | 10352 | 3981 | 4011 | 4041 | 407 | 4101 | 4131 | 416 | 4192 | 222 | 25 | 14 |
| 15 | 1179 |  | 1121 | 1091 | 1062 | 33 | 1003 | 0974 |  | 11.09 |  | 0726 | 0758 | 79 | 0823 | 0855 | 0887 | 0920 | 0952 | 0984 | 15 |
| 16 | 859 | 8560 | 8529 | 8497 | 8466 | 8435 | 8404 | 8372 | 8341 | 1188310 | 107406 | 7441 | 7475 | 7510 | 7544 | 7579 | 7613 | 7648 | 7682 | 7716 | 16 |
| 17 | 60 | 59 |  |  |  | 5837 | 5804 |  |  | 12.5 | 11 | 415 | 419 | 4229 | 4266 | 43 | 4339 | 437 | 4412 | 4449 | 7 |
| 18 | 341 | 33 |  |  |  | 3239 | 320 |  | 31 | 13 | 12 | 087 | 09 | 0948 | 0987 | 1026 | 1065 | 1104 | 1142 | 1181 | 18 |
| 19 | 08 | 079 |  | 0716 |  | 0641 | 600 | 0567 | 053 | 14.0 | 12.7 | 75 | 76 | 7668 | 7709 | 7750 | 75 | 7831 | 7872 | 791 | 9 |
| 20 | 823 | 8200 | 8161 | 8122 | 8083 | 8044 | 05 | 7965 | 26 | 788 | 13.4258 | 4301 | 434 | 388 | 443 | 447 | 451 | 4559 | 660 | 64 | 20 |
| 21 | 56 |  |  |  |  |  |  |  |  |  | 14：0971 |  |  |  |  |  |  |  |  |  | 21 |
| 22 | 306 | 302 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 22 |
| 23 | 047 | 043 | 03 | 0340 | 0295 | 0250 | 0205 | 0160 | 0115 | 17 | 15. | 4446 | 4496 | 4545 | 458 | 46 | 4694 | 4743 | 4793 | 4842 | 23 |
| 2 | 78 |  |  |  |  |  | 7605 |  |  |  | 16. | 1 | 213 | 1265 | 13 | 1368 |  | 1471 | 1523 | 575 | 24 |
| 25 | 529 | 525 | 5201 | 5152 | 03 | 555 | 500 | 4957 | 4908 |  | 16 | 7876 | 930 | 7983 | 8038 | 8092 | 8146 | 8199 | 25 | 307 | 25 |
| 26 | 27 | 26 | 2609 | 2558 | 2508 | 2457 | 2406 | 2355 | 2304 | 19.2253 | $17 \cdot 4535$ | 4591 | 4647 | 4703 | 47 | 4815 | 4871 | ｜ 4927 | 14983 | 5039 | 26 |
| 27 | 01 | 00 |  |  | 9912 | 9859 |  |  |  |  | 18.1 | 130 |  | 142 | 14 |  |  |  |  |  | 27 |
| 28 | 7535 | 748 |  | 73 |  | 7261 | 720 |  |  | $20 \cdot 70$ | 18.79 |  | 808 |  | 8202 |  |  | 83 |  | 850 | 28 |
| 29 | 494 | 489 | 483 | 471 | 4720 | 4663 | 460 | 455 | 4493 | 21.4436 | 19 | 4736 | 4799 | 486 | 492 | 4986 | 5049 | 5111 | 5174 | 523 | 29 |
| 30 | 2359 | 2300 | 2241 | 2183 | 2124 | 2065 | 2007 | 1948 | 889 | 22．183 | 20．138 | 1452 | 1516 | 1581 | 1645 | 171 | 77 | 183 | 1904 | 968 | 30 |
| 31 | 977 | 9710 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 718 | 712 |  |  | 6932 |  |  |  | 6682 |  | 2148 |  |  |  |  |  |  |  |  | 5433 | 32 |
| 33 | 459 | 453 | 44 | 440 | 4337 | 4272 | 4207 | 4143 | 40 | 24．401 | 22. | 159 | 1668 | 173 | 18 | 18 | 1952 | 2023 | 2094 | 216 | 33 |
| 34 | 200 | 938 |  | ， | 1741 |  |  | 541 | 1475 | 25.14 | 22.82 | 8312 | 838 |  | 85 | 860 | 8678 | 8751 | 8824 | 8897 |  |
| 35 | 941 | 935 | 9282 | 13 |  | 9076 | 9008 | 893 | 8871 |  | $23 \cdot 4951$ | 5027 | 510 | 517 | 525 | 532 | 5404 | 47 | 55 | 630 | 35 |
| 36 | 68 | 6760 | 6690 | 6619 | 6549 | 6479 | 6408 | 6338 | 6267 | 26．6197 | 24．1664 | 1742 | 1819 | 189 | 197 | 205 | 2130 | 2207 | 2285 | 236 | 36 |
|  | 42 | 417 | 4098 | 4025 | 3953 | 388 |  |  |  |  | 24•8377 | 845 | 853 |  |  |  |  |  | 01 |  | 37 |
| 38 | 165 | 15 |  | ， | 1357 | 1283 |  |  | 106 | 28.09 | $25 \cdot 50$ | 517 |  |  |  |  |  |  | 574 |  | 38 |
| 39 | 906 | 89 |  | 88 |  | 868 |  | 853 | 845 | 28.838 | $26 \cdot 1803$ | 1887 | 197 | 205 | 213 | 2223 | 2307 | 2391 | 2475 |  |  |
| 40 | 6478 | 6400 | 6322 | 6244 | 6165 | 6087 | 6009 | 59 | 585 | 29.57 | 26 | 8602 | 868 | 8774 | 8861 | 8947 | 9033 | 9119 | 9205 | 291 | 40 |
| 41 | 3890 | 3810 |  |  |  |  |  |  |  |  | $27 \cdot 5229$ |  |  |  |  |  |  |  |  |  | 41 |
| 42 | 1302 | 122 | 113 | 1056 | 0974 | 089 | 080 |  |  | 31.05 | $28 \cdot 1942$ |  |  | 22 |  |  |  |  |  | 27 | 42 |
| 43 | 871 | 863 | 8546 | 846 | 8378 | 8294 | 8210 | 8126 |  |  | 28 ＇8654 |  | 8840 | 893 |  |  | 9210 | 9303 | 395 | 288 | 43 |
| 44 | 612 | 60 |  | 5868 |  |  | 5610 |  | 5438 | 32.535 | 29.5367 | 5462 | 555 | 5652 |  |  | 593 | 63 | 6126 | 221 | 44 |
| 45 | 35 |  |  |  |  |  |  |  |  |  |  | 2177 | 227 | 237 |  | 2565 | 2662 | 2759 |  | 295 | 45 |
| 46 | 09 | 08 | 0770 |  |  |  | 041 |  |  |  |  | 889 | 899 |  |  |  |  |  |  |  | 46 |
| 47 | 83 | 82 | 8178 |  |  |  |  |  |  |  |  |  |  |  |  |  | 6114 | 621 |  |  | 47 |
| 48 | 577 | 5680 | 5586 | 5492 |  | 53 | 521 | 51 | 5023 | $35 \cdot 49$ | 32.2219 | 23 | 242 |  |  |  | 83 | 2943 | 3046 |  | 48 |
| 49 | 318 | 3090 |  |  |  |  |  |  | 24 |  |  | 903 | 914 |  |  |  | 9565 |  |  |  | 49 |
| 50 | 05 | 0500 | 0402 | 0305 | 0207 | 0109 | －011 | 9913 | 9816 | 36.9718 | 33 | 57 | 5860 | 5968 | 6076 | 6183 | 6291 | 6399 | 6506 | 661 | 50 |
| 51 | 8010 |  |  |  |  |  |  |  |  |  | 34.23 |  |  |  |  |  |  |  |  |  |  |
| 52 | 5422 | 532 | 52 | 17 | 5 | 4913 | 481 | 4710 | 4608 | 38.45 | 34.90 | 91 | 9295 | 947 | 95 |  | 9743 | 砣 |  | 07 | 52 |
| 5 | 283 | 273 | 26 |  |  | 2316 |  |  |  |  |  |  | 60 | 6126 |  |  | 6469 | 658 | 667 |  | 53 |
| 5 | 02 | 01 |  |  |  |  |  |  |  | 39.92 | 36 | 2613 |  |  |  | 3078 | 3194 | 331 | 3427 | 354 | 54 |
| 55 | 76 | 755 |  | 7335 |  |  | 70 |  | 679 | 40.66 | 36 | 9328 | 9446 | 95 | 9683 |  | 9920 | －039 | 0157 | 227 | 55 |
| 56 | 506 | 496 |  |  |  |  | 441 |  |  | 41 |  | 6043 |  |  |  |  |  |  |  |  |  |
| 5 | 24 | 237 |  |  |  |  |  |  |  | 42 | 38 | 275 |  |  |  |  |  |  |  |  |  |
| 58 | 989 | 97 |  | 9553 |  | 932 |  |  |  | 2 | 38 | 9473 | 95 |  |  |  | 409 | 22 | O347 |  | 58 |
| 59 | 73 |  |  |  |  |  |  |  | 638 | $43 \cdot 62$ | $39 \cdot$ | 618 |  |  |  |  | 68 | 205 | 7077 |  |  |
| 60 | 4717 | 46 |  | 4366 | 4248 | 41 | 4014 | 38 | 3779 | 44.366 | 40＇2774 | 2903 | 3032 | 31 | 3291 | 3420 | 3549 | 3678 | 3808 | 393 | 60 |
| 61 | 2129 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 95 | 94 | 929 | 9178 |  | 893 |  |  | 8571 | 45 | $41^{\circ} 6$ | 63 | 646 | 660 | 67 | 68 | 硣 |  |  | 740 | 62 |
| 63 | 695 | 68 |  |  |  |  | 621 |  | 596 | $46 \cdot 58$ | 42．291 |  |  |  |  |  |  |  |  |  | 63 |
| 64 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7178 |  | 72 |  | 64 |
| 65 | 177 | 1650 | 1523 |  |  | 114 | 101 | 088 | 076 | 48.063 | 43.633 | 647 | 661 | 67 | 689 |  | 717 | 7318 | 745 |  | 65 |
| 66 | 91 | 906 |  |  |  |  |  |  |  | 48.802 |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 66 |  |  |  |  |  |  |  |  | 49 |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 401 |  |  |  | 3481 |  |  |  |  |  | 45 | 662 | 677 |  |  |  |  | 7502 | 764 |  | 68 |
| 69 | 14 | 12 | 1155 | 1020 | 0885 | 075 | 06 | 0480 | 0345 | 51.021 |  | 33 | 348 |  | 378 | 393 | （1082 | 423 | 4379 | 452 |  |
| 70 | 88 | 87 |  |  | 8290 |  |  |  |  |  | 03 |  |  |  | 050 |  |  | 95 | 110 |  | 70 |
| 71 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 71 |
| 72 | 36 | 35 | 33 | 3239 |  | 295 | 28 | 267 | 253 | 53.23 | $48 \cdot 332$ |  | 363 |  | 39 | 410 | 42 | 441 | 45 | 1 | 72 |
| 73 | 107 |  |  |  |  |  |  |  |  | 53.97 | 49.00 | ， | 2356 |  | 063 | 0828 | 298 | ， | 129 |  | 73 |
| 74 | 848 | 8340 | 95 | 2051 | 7906 | 776 | 7617 | 7472 | 7327 | 54.718 | $49 \cdot 675$ | 6914 | 7073 | 723 | 7392 | 75 | 771 | 787 | 802 | 818 | 74 |
| 75 | 589 | 575 | 5603 | 5457 | 5310 | 5164 | 50 | 4870 | 472 | 55＇45 | $50 \cdot 34$ | 3629 | 3790 | 3952 | 1114 | 4275 | 4437 | 4598 | 4759 | 492 | 75 |
| 76 | 330 | 316 | 3011 |  | 2714 |  | 2417 |  | ， | 56．1971 | 51.0180 | 0344 |  |  |  |  |  |  | 1490 |  | 76 |
| 77 |  |  |  |  |  |  | 2017 |  |  |  |  | 7 | 225 | 591 |  | 772 | 楮 |  | 220 |  |  |
| 78 | 8132 | 79 | 28 | 7675 | 7523 | 7370 | 7218 | 706 | 6912 | $57 \cdot 67$ | 52•360 | 377 | 394 | 411 | 4278 | 4446 | 461 | 478 | 495 | 51 | 78 |
| 79 | 5544 | 5390 |  | 5081 | 4927 | 4772 | 4618 | 4463 | 4309 | 58.415 | 咗 | 0488 | 065 | 083 |  | 1170 | 1340 |  | 矿 |  | 79 |
| 80 | 295 |  |  |  | 2331 | 2174 |  |  |  | 15 | $53 \cdot 70$ | 204 | 37 | 754 | 772 | 789 | 806 | 823 | 341 | 358 | 80 |
| 81 | 036 |  |  |  | 973. | 957 |  |  |  |  |  |  | （1） |  | 11 | 461 | 15 | 496 | 5140 |  | 81 |
| 82 | 778 | 762 | 7460 | 7300 | 713 | 697 | 6818 | 6658 | 6498 | 60.633 | 55.045 | 063 | 081 | 09 | 116 | 1341 | 15 | 169 | 187 |  | 82 |
| 83 | 5192 |  |  |  |  |  | 4219 |  | 析 | －373 | 55.7170 | 7349 | 7528 |  | 1886 | 8064 | 8243 | 8422 |  |  |  |
| 84 | 2604 | 2440 | 2276 | 2112 | 1948 | 1783 | 1619 | 1455 | 1290 | $62 \cdot 1126$ | 56.388 | 4064 | 424 | 442 | 460 | 478 | 496 | 515 | 533 | 55 | 84 |
| 85 | 10 | 9850 | 9684 | 9518 | 52 | 9185 | 9019 | 8853 | 8686 | 62.852 | 57 | 0779 | 0963 | 1146 | 1329 | 151 | 169 | 187 | 206 | 22 | 85 |
| 86 | 74 | 7260 |  | 6924 | 6756 | 6588 | 6419 | 6251 | 883 | $63 \cdot 59$ |  | 7494 | 7680 |  |  |  | 842 |  |  |  | 86 |
|  | 4840 | ， |  |  | 156 | 仡 |  | 10： | 347 | 64 | 58.40 | 420 | 11 |  | 4 | 仡 | 5181 | 536 | 521 | 576 |  |
| 88 | 2252 | 2080 | 1908 | 17 | 156 | 139 | 1220 | 1048 | 087 | 65.070 | 59.0735 | 092 | 111 | 130 | 149 | 168 | 18 | 2062 | 22 |  |  |
| 8 | 9664 | 90 | 316 |  | 8968 | 8794 | 8620 | 446 | 8272 | 8097 | 59.7448 | 7640 | 783 | 802 | 8215 | 8406 | 8598 | 8790 | 898 | 17 | 89 |
| 90 | 7076 | 6900 | 6724 |  | 6372 | 619 | 6020 | 584 | 5668 | 66．549 | 60.4161 | 435 | 4549 | 4742 | 4936 | 5130 | 532 | 5518 | 571 | 590 | 90 |
| 91 | 448 | 4310 | 4132 |  | 377 | 3598 | 3420 |  | ， |  | 61.087 | 1070 | 128 | 146 | 16 | 1854 | 276 | 224 | 244 |  |  |
| 92 | 190 | 1720 | 1540 | 1360 | 1181 | 100 | 082 | 064 | 046 | 68.02 | 61758 | 778 | 798 | 81 | 8379 | 857 | 877 | 397 | 917 | 矿 | 92 |
|  | 9312 | 9130 | 8948 | 81 | 8585 | 8403 | ， |  | 857 |  | 62＇4299 | 450 | 470 | 4 | 510， | 530 | 5so | 570 | 590 | ， | 93 |
| 94 | 6724 | 6540 | 6356 | 617 | 598 | 580 | 5621 | 5437 | 5253 | $69 \cdot 506$ | $63 \cdot 1012$ | 121 | 141 | 162 | 182 | 202 | 22 | 2429 | 263 | 283 | 94 |
| 95 | 41 | 3950 |  | 3579 | 3393 | 3207 | 3021 | 2835 | 2650 | 70 | 63.772 | 7930 | 8135 | 833 | 8544 | 8748 | 8953 | 9157 | 9362 | 956 | 95 |
| 96 | 1547 | ， | 1172 | 0985 | 0797 | 060 | 0422 |  | 1046 |  | 6444 |  | 485 |  | 187 | 54 | 567 | 588 | 6092 |  |  |
| 97 | 895 |  | 8580 | 8391 | 8201 | 8012 | 7822 | 7632 | 743 | 7125 | 65.1151 | 136 | 569 | 178 | 198 | 219 | 24 | 26 | 282 | 303 |  |
| 98 | 6371 | 61 | 5989 | 5797 | 5605 | 5414 | 5222 | 530 | 4838 | 72.4647 | $65 \cdot 7864$ | 807 | 828 | 84 | 8708 | 891 | 913 | 93 | 9552 | 976 | 98 |
| 99 | 3783 | 900 | 937 |  | 3010 | 2816 | 22 | 2429 | 235 | 204 | $66 \times 4577$ | 4790 | 5003 | 2， |  |  |  | 963 | 6282 | 星 |  |
| 100 | 1195 | 1000 | 0805 | 09 | 0414 | 0218 | ${ }^{0} 23$ | 9827 | 9631 | 3．943 | 67：1290 | 1505 | 1721 | 1936 | 2152 | 2367 | 2582 | 2797 | 3013 | 3228 | 100 |
|  | $5{ }^{\prime}$ | $49^{\prime}$ | $48^{\prime}$ | 47 | $46^{6}$ | 45 | 44 | $43^{\prime}$ | $42^{\prime}$ | $41^{\prime}$ | $50^{\prime}$ | $49^{\prime}$ |  | $47^{\prime}$ | 46 | $45^{\prime}$ |  | $43^{\prime}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $7^{\circ}$ |

TRAVERSE TABLES．

| 42 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $42^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $20^{\prime}$ | $21^{\prime}$ | $22^{\prime}$ | 2.3 | $24^{\prime}$ | $25^{\prime}$ | $26^{\prime}$ | 27 | $28^{\prime}$ |  |  | 21 | $22^{\prime}$ |  | 24 | $25^{7}$ | 26 | $27^{\prime}$ |  |  |  |
|  | 7392 | 7390 | 7388 | 7387 | 7385 |  | 7 | 737 | 7377 | ＇737 | 6734 | 6737 | 6739 | 6741 | 6743 | 67 |  | 6749 |  |  |  |
|  | 478 | 478 | 477 | 477 | 4769 | 47 | 47 | 475 | 47 | 1474 | $1 \cdot 34$ | 3473 | 347 | 3482 | 3486 | 3490 |  | 34 |  |  |  |
|  | 2177 | 2171 | 2165 | 2160 | 2154 | 2148 | 2142 | 2136 | 21 |  |  | 0210 | 02 | 0223 | 0229 | 02 | 2 | 0248 | 0255 | 0261 |  |
|  | 957 | 9562 |  |  |  | 9530 |  | 515 |  |  | 2.6939 | 69 | 695 | 6964 | 69 | 69 | 6989 | 6998 | 200 |  |  |
|  | 6962 | 6952 | 6942 | 6933 | 23 | 6913 |  | 6893 | 6884 | 3.6874 | 3.3672 | 3683 | 369 | 370 | 37 | 372 | 3737 | 3747 | 375 | 376 |  |
|  | 435 | 43 | 4331 | 4319 | 4307 | 4296 | 428 | 4272 | 4260 | 4.4248 | 4.0407 | 0419 | 0432 | 0445 | 0458 | 04 | 0484 | 0497 | 0510 | 0523 |  |
|  | 17 | 17 | 171 |  | 16 | 16 |  |  |  |  |  | 7156 | 717 | 718 | 72 | 7216 |  | 7246 | 726 | 7276 |  |
|  | 913 | 912 | 9108 | 90 | 9076 |  |  |  | 901 |  |  | 789 | 3910 | 39 | 3944 | 31 | 79 | 3996 | 4013 | 4030 |  |
|  | 653 | 651 |  | 6479 | 6461 | 64 |  | 6408 |  | 6.637 |  | 0629 | 0649 | 06 | 0687 | 0707 | 0726 | 074 | 0765 | 0784 |  |
| 10 | 392 |  | 3885 | 3865 | ， | 382 |  | 3787 | 3767 | 7.374 |  | 366 | 7387 |  | 7430 | 7452 | 73 | 7495 | 75 | 7538 | 10 |
| 11 | 13 | 1295 | 127 |  |  | 1209 |  |  |  | $8 \cdot 112$ | $7 \cdot 4079$ | 4102 | 412 |  |  | 4197 |  |  |  |  |  |
| 12 | 870 | 868 | 866 | 8638 | 86 | 85 |  |  | 852 | 8．8497 |  | 083 | O86 | 0891 |  | 0942 |  | 0994 | 1019 |  | 12 |
| 13 | 610 | 6076 | 60 | 25 | 5999 | 597 |  |  | 5897 | 9．587 | 8548 | 757 | 760 | 7631 | 7659 | 7687 | 7715 | 774 | 777 | 77 | 13 |
|  | 349 |  |  | 341 | 3384 | 335 |  |  | 3274 | 10.324 |  | 43 | 434 | 437 | 440 | 4432 | 4462 | 4493 | 45 | 455 |  |
| 15 | 088 | 08 | 0827 | 0798 | 0768 | 07 | 0709 | 0680 | 0651 | 11.0621 | $10 \cdot 1016$ | 1049 | 108 | 111 | 1145 | 1178 | 1210 | 1242 | 1274 | 30 | 15 |
| 16 | 827 | 82 | 182 | 8184 | 81 | 81 | 8090 | 8059 | 8027 | 11 | 10.7751 | 7785 | 782 | 78 | 7888 | 7923 | 7957 | 7991 | 8026 | 8060 | 16 |
| 17 | 567 | 56 |  |  |  |  |  |  | 5404 | 12．53 | 11.4485 | 4522 | 45 | 45 |  | 46 | 4704 | 47 | 47 | 48 |  |
| 18 | 306 | 30 | 2993 | 295 | 29 | 2887 |  | 281 | 2781 | 13.2 | 12 | 1258 | 129 | 1336 | 1374 | 1413 | 14 | 1490 | 152 | 15 | 18 |
| 19 | 045 | 04 |  | 03 | 03 | 026 |  |  | 0157 | 14.12 | 12.7954 | 799 | 803 | 807 | 81 | 81 | 8199 | 240 | 8281 | 832 | 9 |
| 20 | 7848 |  |  |  | 7691 | 7652 |  |  | 7534 | 14.4 | 13.4689 | 4732 | 4775 | 4818 |  | 4903 | 4946 | 498 | 503 | 50 | 20 |
| 21 | 52 | 5199 |  |  | 5076 | 5034 |  | 4952 |  | 15 | 14．1423 | 1468 | 1513 | 1558 |  | 164 | 1694 |  |  |  | 21 |
| 22 | 263 | 25 | 2546 | 250 | 246 | 24 | 2374 | 233 | 228 | 16.22 |  | 820 | 82 | 82 | 83 | 8394 |  | 8488 | 8535 | 858 | 22 |
| 23 | ＋02 |  |  | 98 | 98 | 9800 |  |  | 9664 | $16^{\circ}$ | 15.4892 | 494 | 499 | 50 |  | 51 | 5188 | 5238 | 52 | 53 | 23 |
| 24 | 741 | 737 |  | 7276 | 7229 |  |  |  | 7041 | 17.6 | $16^{\circ}$ | 1678 | 172 | 178 | 183 | 1 | 1936 | 198 | 203 |  |  |
| 25 | 481 | 476 | 4712 | 4663 | 4614 | 4565 | 4516 | 4467 | 4418 | 18.436 | 16 | 841 | 8468 | 8522 | 85 | 862 | 86 | 873 | 879 | 8844 | 25 |
| 26 | 2202 | 2151 | 2100 | 2049 | 1998 | 1947 | 1896 | 1845 | 94 | 19 | 17.5095 | 5151 | 5207 | 5263 | 5319 | 5374 | 5430 | 5486 | 5542 | 5598 | 26 |
| 27 |  |  |  |  |  | 9330 |  |  |  | 19.9118 | 18．183 |  | 1946 |  |  | 2120 |  | 236 | 2294 | 2351 | 27 |
| 28 | 698 | 69 | 687 | 6822 | 6767 | 671 | 6658 | 6603 | 65 | 20.6493 | 18.8 | 86 | 86 | 87 | 880 | 88 | 8925 | 8985 | 9045 | 910 | 28 |
| 29 | 437 |  | 4266 | 42 | 41 | 4095 |  |  |  | 21.38 | 19.5 |  | 5423 | 548 |  | 56 |  |  | 57 | 58 | 29 |
| 30 | 177 |  |  |  |  | 1478 |  |  | 1301 | $22 \cdot 12$ | 20.2033 |  | 2162 | 222 |  | 2355 | 2420 | 2484 | 25 |  | 30 |
| 31 | 916 | 9103 | 9043 |  |  | 8860 |  |  | 8678 | 22•8617 | 20•876 |  |  |  |  | 910 |  |  |  |  | 31 |
| 32 | 65 | 6494 | 64 |  | 6306 | 624 |  | 611 | 605 |  |  |  |  |  |  |  |  | 5983 | 6052 | 612 | 32 |
| 33 | 394 |  |  |  | 3690 |  |  |  | 3431 | 24．3366 | 22．22 | 230 | 237 | 244 |  | 259 | 2662 | 2732 | 2803 | 287 | 33 |
| 34 | 134 | 127 | 1208 |  | 107 | 08 | 094 | 0875 | 0808 |  | 22 | 90 | 91 | 91 |  | 93 | 9409 | 9482 | 9555 |  | 34 |
| 35 | 8734 | 86 |  | 8528 | 8459 | 8391 |  | 8253 |  | 25.8116 | $23 \cdot 5$ | 57 | 58 | 593 |  | 60 | 61 | 6231 | 6306 | 638 | 35 |
| 36 | 6126 | 6056 |  |  | 5844 | 5773 |  |  |  | 26.549 | $24^{243}$ | 2517 | 2594 | 2672 | 2749 | 2826 | 2903 | 2981 | 3058 | 313 | 36 |
| 37 | 35 |  | 337 |  | 3228 | 3156 |  |  |  | $27 \cdot 2865$ | 24.91 | 9253 | 933 | 941 |  |  |  |  | 810 |  | 37 |
| 38 | 09 | 083 | 076 | 0688 | 0613 | 538 | 0464 | 038 | 0315 | 28.0240 | $25 \cdot 59$ |  | 607 | 61 | 62 | 63 | 6398 | 6480 | 6561 | 6643 | 38 |
| 39 | 83 |  |  | 8074 |  | 7921 |  |  |  |  | 26 | 2727 | 281 | 289 | 297 | 306 | 31 | 3229 | 331 | 339 | 39 |
| 40 | 56 |  | 553 |  | 5382 | 5304 |  |  | 5068 | 29.499 | 26.937 |  |  | 9635 | 972 |  |  |  | ＋064 | 015 | 40 |
| 41 | 30 | 3008 | 2927 |  | 276 | 2686 |  |  |  | 30．236 | $27 \cdot 611$ |  |  | 637 |  | 655 |  |  |  |  | 41 |
| 42 | 04 | 039 | 0316 | 0234 | 0151 | 1069 |  |  | 9822 |  |  |  |  |  |  |  |  |  |  |  | 42 |
| 43 | 78 |  |  |  | 7536 | 7451 |  |  |  | 31.7114 |  |  | 9765 | 9858 |  |  |  |  | 0319 |  | 43 |
| 44 | 52 | 5179 | 5093 |  | 4920 |  | 4748 | 4661 | 45 |  |  |  | 6504 | 659 | 66 | 678 | 6882 | 6977 | 707 |  | 44 |
| 45 | 265 | 25 | 2 | 2393 | 23 | 22 | 2128 | 2040 | 19 | 33 | 30 | 3146 | 32 | 333 | 34 | 35 | 36 | 3726 | 382 | 391 | 45 |
| 46 | ＋050 | 9960 | 9870 | 9780 | 9689 | 959 |  |  |  | 33．9238 | $30 \cdot 97$ |  |  | －080 |  |  |  |  | 0574 |  | 46 |
| 47 | 74 | 73 | 72 | 71 | 7074 | 6982 |  | 6176 |  | 34．6613 | $31 \cdot 65$ |  |  | 682 | 69 | 702 |  | 225 |  |  | 47 |
| 48 | 483 | 47 |  | 45 | 4459 | 析 | 4270 | 417 |  | 35 |  |  |  | 356 |  |  |  |  | 4077 | 418 | 48 |
| 49 | 22 |  |  |  |  | 47 | 1651 | 1555 | 1458 | $36 \cdot 1$ | 32 |  | 0198 | 03 | 0408 | 05 | 0619 | 0724 | 0 |  | 49 |
| 50 | 9620 | 9522 |  | 932 | 9228 | 30 | 9031 | 8933 | 8835 | 36．873 | $33 \cdot 67$ |  | 6936 | 7044 | ， |  | 73 | 7473 | 581 |  | 50 |
| 51 | 70 |  |  |  | 661 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 | 44 | 4303 | 42 | 4 |  | 389 |  | 369 |  | 38 |  |  | 04 |  |  |  |  |  |  |  | 52 |
| 53 | 17 | 1693 | 1589 | 1485 | 1381 | 127 | 1173 | 106 |  | 39 | 35 |  | 7153 | 726 | 73 |  |  | 22 | 7835 |  |  |
| 54 | 91 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4587 |  |  |
| 55 | 6582 | 6474 | 6366 | 6258 | 6150 | 6043 |  | 5827 | 5719 | $40 \cdot 5611$ | 37 | 0512 | 0630 | 0748 | 0866 |  | 1103 | 1221 | 1339 | 145 | 55 |
| 56 | 3974 | 386 |  |  |  |  |  |  |  | 41.2985 |  |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 136 | 12 | 11 | 103 | 0920 | 0808 |  | 058 |  | 42.0360 | 38＇ |  | 4107 | 423 |  | 44 |  | 4720 | 48 | 496 | 57 |
| 58 | 87 |  |  |  |  |  |  | 7963 |  | 42．7735 | 39.05 |  |  | 097 |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  | 5457 |  |  | 3.51 |  | 74 | 758 | 771 | 783 |  | － | 18 | 83 | 847 | 5 |
| 60 | 354 | 3426 | 3309 | 3191 | 3073 | 2956 | 2838 | 27 | 2602 | $44^{\circ} 2$ | 40 | 419 | 43 | 4453 | 4581 | 47 | 48 | 4968 | 5097 | 522 | 60 |
| 61 |  |  |  |  |  |  |  |  |  |  |  |  | 706 |  | －0 |  |  |  |  |  |  |
| 62 |  |  |  |  |  |  |  |  |  | $45 \cdot 7234$ |  |  |  |  |  | S2 |  |  |  |  | 62 |
| 63 | 57 |  | 54 | 535 | 5227 | 5103 | 498 | 485 |  | $46^{\circ} 460$ | 42. |  | 454 | 467 | 48 | 494 |  | 5216 | 535 |  | 63 |
| 64 |  |  |  |  |  |  |  | 2235 |  | 47 |  |  | 1279 | 141 | 15 |  |  |  |  |  |  |
| 65 |  |  |  |  |  |  |  |  |  | $47 \cdot 93$ | 43 |  |  | 815 |  |  |  |  |  |  | 65 |
|  |  |  |  | 7510 |  | 725 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 529 | 515 | 5028 | 4897 | 47 | 463 | 45 | 437 | 42 | 49.410 | 45.12 | 13 | 149 | 163 | 17 | 19 |  | 2214 |  | 250 | 67 |
| 68 | 268 |  |  |  |  |  |  |  |  | 50．14 | $45^{\prime} 79$ | 80 | 82 | 8380 | 85 | 867 |  |  |  | 925 | 68 |
| 69 | －075 | 9940 |  |  | 9534 | 93 |  | 9128 | 8993 | 50.885 | 46.467 | 4824 | 4972 | 5120 | 526 | 541 | 556 | 571 | 586 |  | 69 |
| 70 | 746 | 7330 | 719 | 7056 | 691 | 6781 | 6644 | 6507 | 63 | 51．623 | $47 \cdot 141$ | 1560 | 171 | 1861 | 2012 | 216 | 231 | 2463 | 2613 | 276 | 70 |
| 71 | 486 | 4 |  | 4443 | 4303 | 41 |  |  |  | 52．360 | 47•814 | 829 | 8450 | 8602 | 875 |  |  | 212 | 936 | 927 |  |
|  | 22 |  |  |  |  |  |  |  |  | 53.09 |  | 5034 |  | 534 | 548 |  |  |  | 611 |  | 72 |
| 73 | 964 | 950 | 935 | 9216 | 9072 | 89 | 8786 | 8643 | 84 | 53＇835 | 49.16 | 1770 | 1927 | 2084 | 224 | 239 | 25 | 27 | 286 | 302 | 73 |
| 74 | 7037 |  |  |  | 5 |  |  | 6021 | 5876 | 54．5731 | 49.834 | 85 | 8666 | 882 | 898 | 914 |  | 946 | 961 | 977 | 74 |
| 75 | 443 |  |  |  |  |  |  |  |  | 55：3105 | 50.5082 |  |  |  | 572 |  |  |  | 631 | 65 | 75 |
| 76 | 1822 | ， 6 | 1524 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
| 77 | 921 | 906 | 89 | 87 | 86 | 846 | 8308 | 815 | 80 | 56．785 | 51.85 | 87 | ． 888 | 904 | 921 | 937 | 95 | 9709 | 987 | 10 | 77 |
| 78 | 6607 |  |  | 8788 |  |  |  | 5536 |  | 52 | 52.528 |  | 5621 | 578 | 595 | 612 |  | 6458 |  |  | 78 |
| 79 | 3999 | 384 | 3690 | 3535 | 3380 | 3225 | 30 | 2915 | 2760 | 58．2604 | 53.202 | 219 | 2359 | 2529 | 2699 | 286 | 303 | 3208 | 3377 | 354 | 79 |
| 80 | 1392 | 1235 | 1078 | 092 | 0764 | 060 | 045 | 0293 | ＋136 | 58：997 | 53.87 | 8926 | 909 | 927 | 944 | 961 | 97 | 99 | ＋12 | 030 | 80 |
| 81 | 878 | 8625 |  |  |  |  |  | 7672 |  |  |  | 5663 | 583 | 275 | 618 | 635 |  | 6707 | 矿 | 705 | 81 |
| 82 | 6176 |  | S | 50 | 5533 | 5373 | 5212 | 5051 | 4 | 60.47 | 55 | 2136 | 231 | 27 | 2981 | 310 |  | 208 | 析 | 矿 | 82 |
| 83 | 3569 | 340 | 32 | 30 | 2918 | 2755 | 2592 | 2429 | 2266 | 61.210 | 55.895 | 9136 | 9314 | 949 | 967 | 98 | －027 | 020 | 038 | 05 | 83 |
| 84 | 0961 | 0197 |  |  |  | － |  |  | 70 | 487 | 56.5692 | 587 | 605 | 623 | 6414 | 659 |  | 硅 | 仿 | 731 | 84 |
| 85 | 835 | 8187 |  | 7854 | 7687 | 752 | 7353 | 7187 | 702 | 62.6853 | 57．242 | 260 | 279 | 297 | 315 | 334 | 35 | 3705 |  |  | 85 |
| 86 | 5746 | 557 | 5409 | 5240 | 5072 | 490 | 34 | 45 | 4396 | 3.422 | 57.91 | 346 | 953 | 9715 | 990 | ＋085 | 026 | 0454 | 083 | ， | 86 |
| 87 | 313 | 2968 | 2797 | 2627 | 24 | 228 | 2115 | 1944 | 1773 | $64 \cdot 160$ | 58.58 | 6082 | 626 | 645 | 6643 | 683 | 7017 | 72 | 739 | 757 |  |
| 88 | 053 |  | 0186 | ， | 98 | 9668 | 9495 | 9323 | 913 | 64•897 | 59.26 | 281 | 3008 | 3197 | 源 | 357 | 3764 | 395 | 414 | 433 | 88 |
| 89 | 7923 | 7749 | 7576 | 74 | 72 | 7051 | 6876 | 6701 | 65 | 65.6352 | 59.93 | 95 | 974 | 9938 | －129 | 03 | 05 | 070 | 0893 | 108 | 89 |
| 90 | 531 | 5139 | 4963 | 4786 | 4610 | 4433 |  | 4080 | 3903 | 6．3726 | 60．609 | 6292 | 6485 | 667 | 687 | 7065 | 72 | 745 | 764 | 78 | 90 |
| 91 | 2708 |  |  |  | 9370 |  |  |  |  |  |  |  |  | 3420 |  | 385 |  |  |  |  |  |
| 9 | ＋100 | 9920 | 97 | 9559 | 9379 | 9198 | 9018 | 883 | 865 | $67 \cdot 8476$ | 61.956 | 97 | 9963 | －161 | 035 | 055 | 0750 | 0951 | 148 | 1 | 析 |
| 93 | 749 | 7310 | 7128 | 694 | 67 | 6581 | 63 | 6216 | 6033 | 68.585 | 62．6302 | 6502 | 6702 | 690 | 710 | 730 | 750 | 7700 | 7900 |  | 93 |
| 94 | 4885 | 4701 | 457 | 4332 | 4148 | 3964 | 3779 |  | 3410 | 69.32 | 63.3036 | 3238 | 34 | 3642 | 3844 | 404 | 4248 | 445 | 4652 | 16 | 94 |
| 9 | 2277 | 2091 | 1905 | 1719 | 1533 | 1346 | 1160 | 0973 | 0787 | 70．06 | $63 \cdot 9771$ | 75 | 1179 | 038 | 05 | 079 | 0995 | 119 | 1403 | 160 | 95 |
| 96 | 9670 | 9482 | 9294 | 05 | 8917 | ${ }^{8729}$ | 8540 | 8352 | 63 | 70．7975 | 64.6505 | 6711 | 6918 | 7124 | 7330 | 753 | 774 | 7949 | 8155 | 83 | 96 |
| 97 | 7062 | 6872 | 682 | 6492 | 6302 | 6111 | 592 | 573 | 5540 | $71 \cdot 5350$ | $65 \cdot 3239$ | 3448 | 3657 | 3865 | 407 | 428 | 449 | 4698 | 490 | ， 1 | 97 |
|  | 445 | 42 | 407 | 3878 |  | 3494 | 3302 | 310 | 291 | 72.2724 | 65．9974 | 1185 | 0395 | 060 | 081 | 1027 | 12 | 1418 | 1658 | 1868 | 98 |
|  | 1847 | 1653 | 1459 | 1265 | 1071 | 08 | 0682 | 0488 | 0294 | 73.0099 | 66.6708 | 6921 | 7134 | 7347 | 7559 | 7772 | 7985 | 8197 | 8410 | 8622 | 99 |
| 100 | 239 | 044 | 8848 | 865 | 3455 | 8259 | 8063 | 887 | 7670 | 3.7474 | 3443 | 3658 | 3873 | 4088 | 4302 | 4517 | 4732 | 4947 | 5161 | 5376 | 100 |
|  | $40^{\prime}$ | $39^{\prime}$ | 38 | 37 | 36 | 35 | $34^{\prime}$ | 33 | 32 | $31^{\prime}$ | $40^{\prime}$ | $39^{\prime}$ | 38 | $37^{\prime}$ | 36 | $35^{\prime}$ | 34 | $33^{\prime}$ | 32＇ | $31^{1}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | INE |  |  |  |  |  |

TRAVERSE TABLES．

| 42 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $42^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | $33^{\prime}$ | $34^{\prime}$ | $35^{\prime}$ | $36^{\prime}$ | $37^{\prime}$ | $38^{\prime}$ | 39 |  | $31^{\prime}$ | $32^{\prime}$ | 33＇ | 34 | $35^{\prime}$ | $36^{\prime}$ | 37 |  |  |  |
|  | 7373 | 73 | 73 | 7367 | 7365 | 73 | 7361 | 7359 | 73 | 735 | ＇675 | 6758 | 6760 | 6762 | 6764 | 6767 | 6769 | 6771 | 5773 |  |  |
|  | 47 | 474 | 473 | 4734 | 4730 | 472 | 47 | 47 | 47 | $1 \cdot 47$ | $1 \cdot 3512$ | 3516 | 35 | 3525 |  | 3533 | 析 | 3542 | 3546 |  |  |
|  | 2118 | 2112 | 2107 | 210 | 209 | 208 | 2083 | 2077 | 2071 | 2.206 | $2 \cdot 02$ | 0274 | 028 | O2 | 0293 | 030 | 030 | 0313 | 0319 | 032 |  |
|  | 94 | 9483 | 947 |  |  |  |  |  | 9428 |  | －7028 | 7032 |  | 7049 | 7058 | 7066 | 7075 | 7084 | 092 |  |  |
|  | 686 | 685 |  |  |  |  |  |  |  |  |  | 3790 | 3801 |  |  | 3833 | 3844 | 3855 | 86 |  |  |
| 6 | 423 | 4225 | 4213 | 4201 | 4189 | 4178 | 416 | 415 | 4142 | 413 | 4.0535 | 0548 | 0561 | 0574 | 0587 | 0600 |  | 0625 | 038 |  |  |
|  | 160 | 159 | 15 | 1568 | 15 | 154 |  | 151 |  |  |  |  | 73 | 73 |  | 73 |  |  | 7411 |  |  |
|  | 89 |  |  |  |  | 8904 | d | 88 | 88 | 5.884 | 5．4047 | 4064 | 408 | 40 | 4116 | 4133 | 50 | 4167 | 4184 | 4201 |  |
|  | 635 | 6337 | 6320 | 6302 | 6284 | 626 | 6249 | 6231 | 62 | 6.619 | 6.08 | 08 | 0842 | 0861 | 0880 | 0900 | 0919 | 0938 | 073 | 0977 |  |
| 10 | 3728 | 左 |  | 3669 | 3649 | 362 |  | 359 | 3570 | 355 | 年 | 7580 | 7602 | 762 | 764 | 7666 | 68 | 770 | 773 | 775 | 10 |
| 11 | 1101 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4480 |  |  | 1 |
| 12 | 84 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1251 | 1276 |  |  |
| 13 | 58 | 58 | 57 | 5769 | 5744 | 57 |  |  |  |  | 1827 | 785 | 8 | 79 |  |  | 7994 | S | 8050 | 80 | 13 |
| 14 | 32 |  |  |  |  |  |  |  |  | 10.297 |  | 4813 | 4643 | 467 | 4703 | 4733 | 63 | 4793 | 4823 | 4853 | 14 |
| 15 | 05 |  |  | 0503 | 0474 | 0444 | 0415 | 0385 | 0355 | 11.032 | 10.1339 | 1371 | 1403 | 1435 | 1467 | 1499 | 1531 | 1564 | 1596 | 1628 | 15 |
| 16 | 7964 | 7933 | 7901 | 7870 | 7839 | 7807 | 7776 | 7744 | 7713 | 11 | $10 \cdot 8094$ | 8129 | 8163 | 8197 | 8232 | 8266 | 8300 | 8334 | 8369 | 840 | 16 |
| 17 | 53 | 5304 | 5270 | 5237 |  | 5170 |  |  | 5070 |  |  |  | 492 |  |  | 50 |  |  | 5142 |  | 17 |
| 18 |  |  |  |  |  | 2533 |  | 2462 | 27 | 13 |  | 1645 | 168 | 1722 | 176 | 1799 | 1838 | 1876 | 1915 |  | 18 |
| 19 | 008 | 0045 | 1008 |  |  |  | 9858 | 9821 | 9784 |  |  |  | 844 | 84 | 8525 | 85 | 8605 | 8647 | 8688 | 872 | 19 |
| 20 | 7455 | 7416 | 7377 | 7338 | 7298 | 7259 | 7219 |  |  | 14 | 13 | 516 | 5204 | 52 | 5290 | 5332 | 537 | 5418 | 5461 |  | 20 |
| 21 | 4828 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 22 | 22 | 21 |  |  |  |  |  |  | 185 |  | 14.8630 | 8677 | 8724 | 8771 |  | 8866 |  |  |  |  | 22 |
| 23 | 957 | 9529 | 9483 | 9438 |  | 9348 |  |  |  | 16.91 |  | 5435 |  | 5534 |  | 56 | 5681 | 573 | 57 |  | 23 |
| 24 |  |  |  |  | 6758 |  |  | 6616 | 6569 |  |  |  |  |  |  |  | 2450 | 2502 | 25 |  |  |
| 25 | 431 | 427 | 422 | 4172 | 4123 | 4074 | 4024 | 3975 | 3926 | 18.38 | 16 | 95 | 900 | 9058 | 91 | 916 | 921 | 9273 | 9326 | 938 | 25 |
| 26 | 169 | 16 | 15 | 1539 | 1488 | 14 | 1385 | 1334 | 1283 | 19 | $17 \cdot 5653$ | 5709 | 5765 | 582 | 5876 | 5932 | 598 | 6043 | 6099 | 6155 | 26 |
| 27 |  |  |  |  |  |  |  |  | 8640 | 19.85 | 18.2409 |  |  |  |  |  |  |  |  |  | 27 |
| 28 | 643 | 63 |  |  | 6217 | 616 |  | 605 | 599 | $20 \cdot 59$ | 18.9165 | 922 | 928 | 93 | 9405 |  |  | 9585 | 964 |  | 28 |
| 29 | 38 | 37 |  |  |  | 352 |  |  | 3354 | 21 | 19.5921 |  | 604 | 61 | 6170 | 232 | 6294 | 6356 | 6418 |  | 29 |
| 30 | 1183 | 112 |  |  | 0947 |  |  |  |  | 22．0652 | 20 |  |  |  |  | 299 | 3063 | 312 |  | 3255 | 30 |
| 31 | 85 |  |  |  |  |  |  |  |  | $22 \cdot 800$ |  |  |  |  |  |  |  |  |  |  |  |
| 32 | 592 | 58 |  |  | 567 | 561 |  |  |  |  |  |  |  |  |  | 6532 |  |  | 6737 |  | 32 |
| 33 | 33 | 32 |  |  | 3042 |  |  |  |  | 24 | $22 \cdot 294$ |  |  |  |  |  |  |  |  |  | 33 |
| 34 | 06 |  |  |  |  |  |  |  |  |  |  | 977 |  |  |  | ．065 |  |  |  |  | 34 |
| 35 | 804 | 79 |  | 7841 | 777 | 7703 | 763 |  | 7496 | $25 \cdot 7427$ | 23.6457 | 653 |  | 66 | 6757 |  | 6907 | 6982 |  | 713 | 35 |
| 36 | 54 | 5349 | 5278 |  | 5137 | 5066 | 499 | 4924 | 4853 | 26.4782 | 24.3212 | 3290 | 336 | 3444 | 3521 | 3598 | 3675 | 3752 | 3829 |  | 36 |
| 37 |  |  |  |  |  |  |  |  |  | 27.21 | 24.9968 |  |  |  |  |  |  |  |  |  | 7 |
| 38 | 01 |  |  |  | 9867 | 979 | 971 | 9642 | 956 | 27. |  |  | 688 |  |  | 713 | 7213 | 729 |  |  | 38 |
| 39 | 75 |  |  |  |  |  |  |  |  | 28 | $26 \cdot 3480$ |  |  |  |  |  | 39 | 406 |  | 423 | 39 |
| 40 | 4911 | 4832 | 4754 | 4675 | 4596 | 4518 |  | 4360 | 4281 | 29.4202 | 27.0236 | 0322 | 0408 | 0493 | 0579 | 0665 | 0750 | 0836 | 0922 | 100 | 40 |
| 41 | 22 |  |  |  |  |  |  |  |  | $30 \cdot 15$ |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 96 | 95 |  |  | 9326 |  |  |  |  |  |  |  |  | 4018 |  |  | 428 |  |  |  | 42 |
| 43 | 70 |  | 6860 |  |  |  |  |  | 6352 | 31.626 | ． 05 |  |  |  |  |  |  |  |  |  | 3 |
| 44 | 4402 | 43 | 4229 | 43 | 4056 | 396 | 3883 | 3796 | 370 | 32．36 | 29. | 735 | 744 | 754 |  | 77 | 782 | 792 |  | 810 | 44 |
| 45 | 177 |  |  |  | 1421 | 13 |  | 1155 |  | 33.09 | 30 | 411 | 420 | 430 | 4401 | 44 | 459 | 469 | 4787 | 48 | 45 |
| 46 | 914 |  |  | 8876 | 8786 | 8695 |  | 8514 |  | 33 | 31.0771 | 087 |  |  |  |  |  |  |  |  | 46 |
| 47 |  |  |  |  |  |  |  |  |  | $34 \cdot 56$ | 31.75 |  |  |  |  |  |  | 8232 |  |  |  |
| 48 | 38 |  | 3704 |  | 3516 | 342 |  | 3232 |  | 35 | 32.4283 |  | 44 |  | 46 | 47 | 4900 | 5003 |  |  | 48 |
| 49 | 12 |  |  |  |  |  |  |  |  | 36．03 | 33．1039 | 11 |  |  |  | 156 | 166 |  |  |  | 49 |
| 50 | 8639 | 8540 | 8442 | 8344 | 8245 | 8147 |  | 7950 | 7852 | $36 \cdot 7753$ | $33 \cdot 7795$ | 7902 |  |  |  | 8331 | 8438 | 854 | 865 | 875 | 50 |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | 33 | 32 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 52 |
|  |  |  |  |  | 03 |  |  | －027 | 9923 | 38 | $35 \cdot 80$ | 8176 |  |  |  | 8631 | 874 |  |  |  |  |
| 54 | 8130 | 8024 | 7917 |  | 7705 |  |  |  |  | 39 | $36 \cdot 48$ | 49 | 50 | 51 | 5282 | 53 | 55 | 56 | 5744 | 586 | 54 |
| 55 | 55 |  |  |  |  |  |  |  |  | 40.45 | 37．1575 |  |  |  |  |  | 硡 |  |  |  | 55 |
| 56 | 287 |  |  |  |  |  |  |  |  | 41.188 |  |  |  |  |  |  |  |  |  |  | 56 |
|  |  |  |  |  |  |  |  |  | 9351 | 41．9238 | $38 \cdot 5086$ |  |  | 5453 |  |  | 5819 |  |  |  |  |
| 58 | 76 | 75 | 7393 | 7279 | 71 |  |  |  | 67 | 42.65 | 39 |  |  |  |  |  |  | 27 |  |  | 58 |
| 59 |  |  |  |  |  |  |  |  | 4065 | ． 39 |  | 872 |  |  |  | 9230 |  |  |  |  | 59 |
| 60 | 2366 | 2248 | 2131 | 2013 | 1894 | 1776 | 1658 | 1540 | 1422 | 44．1304 | $40 \cdot 5354$ | 5483 |  | 5740 | 5869 | 599 | 612 | 625 | 6382 | 651 | 60 |
| 61 | 973 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 71 | 69 |  |  |  |  |  |  |  | 45 ＇60 | 41. |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | ． 33 |  |  |  |  |  |  |  |  |  |  |  |
| 64 | 1857 | 173 | 1606 | 1480 | 1354 | 1228 |  | 0976 |  | 47．07 | 43.23 | 25 | 26 | 27 |  | 30 | 32 |  |  |  | 64 |
| 65 | 923 | 91 |  |  |  |  |  |  |  | $47 \cdot 80$ | 43 | 927 |  |  |  |  | 996 |  |  |  | 65 |
| 66 | 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 134 | 12 | 1081 | 0948 | 0814 |  |  | 0412 | 278 | 50.01 | 45.94 | 95 |  | 98 |  |  | 027 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 碞 |  |  | 6749 |  |  |  |  |  |  |
| 70 | 609 |  | 5819 | 5681 | 5544 | 5406 | 5268 | 5130 | 4992 | 51.48 | 47.29 | 306 | 321 | 336 | 351 | 366 | 381 | 396 | 411 | 42 | 70 |
| 71 | 34 | 33 |  |  |  | ． |  |  | 2349 | 52 | 47.966 | 982 |  | ， | 27 | 0430 | 058 |  |  |  | 71 |
| 72 | 084 |  |  |  |  | ， |  |  |  | 52 | $48^{\circ} 64$ |  |  |  |  |  |  |  |  |  | 72 |
|  | 82 |  |  |  | 76 |  | 735 |  | 7063 | 53.69 | $49 \cdot 31$ | 33 |  | 368 |  |  | 41 | 128 | 4432 |  |  |
| 74 | 5585 | 54. | 52 | 5149 | 5003 | 4858 | 47 | 4566 | 4420 | $54 \cdot 427$ | 49.993 | －09 | 025 | 04 |  | 073 | 088 | 10 | 1205 |  | 74 |
| 75 | 295 | 281 |  |  |  |  |  |  | 1777 | 55\％1630 | 50．6693 | 685 | 701 | 7175 |  |  |  | 7818 |  |  | 75 |
| 76 | 033 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 76 |
| 77 | 77 |  | 01 | 7249 | 7098 | 694 | 6795 | 6643 | 6491 | 56.63 | 52.020 | 0370 | 053 | 0700 | 08 | 103 | 119 | 13 | 1524 | 1 | 77 |
| 78 | 507 | 49 | 47 | 4616 | 44 | 4309 | 4156 | 4002 | 3848 | 57.36 | 52.69 | 712 | 729 | 746 | 7629 | 7796 | 7963 | 81 | S2 | 846 | 78 |
| 79 | 24 |  |  |  |  |  |  | 1861 | 1206 | 58／105 | 5 | 析 | ， | 42 | 4 | 4 | 473 | ， |  |  |  |
| 80 | 9822 | 9665 | 507 | 350 | 9193 | 903 | 8878 | 8720 | 856 | 58：840 | 54.047 | 064 | 081 | 098 | 115 | 132 | 150 | 1672 | 184 | 20 | 30 |
| 8 | 719 | 70 | 6876 |  | 6558 | 6398 | 6239 | 6079 | 220 | $59 \cdot 57$ | $54 \cdot 72$ | 740 | 757 | 7749 | 7923 | 8096 | 82 | 844 | 8616 |  |  |
| 8 | 45 |  | 4245 | 4084 | 3922 | 1 | ， | 438 | 327 | $60^{\circ} 31$ |  | 41 | 433 | 4511 | 468 | 486 | 503 | 21 | 538 |  | 82 |
| 83 | 194 |  | 1614 | 1451 | 1287 | 1124 | 0961 | 0797 | 0634 | 61.0 | 56 | 091 | 108 | 12 | 145 | 16 | 188 | 198 | 216 |  | 83 |
| 84 | 931 | 91 | 8983 | 8818 | 86 | 8487 | 8322 | 8156 | 7991 | 61.78 | 56.74 | 767 | 78 | 80 | 82 | 839 | 857 | 875 | 8935 | 91 | 84 |
| 85 | 668 |  |  |  |  |  |  |  |  |  | 57．4252 | 443 |  | 479 |  | 5163 | 5345 |  |  |  | 85 |
| 86 |  |  |  |  |  |  |  |  |  |  |  | 192 | 37 |  |  | 929 | ， |  |  |  |  |
| 87 | 143 | 126 | 1089 | 0918 | 074 | 0576 | 0404 | 0233 | －062 | 63.98 | 58.77 | 7950 | 813 | 83 | 8509 | 86 | 888 | 906 |  |  | 87 |
| 88 | 880 | 8631 | 8458 | 82 | 5177 | 5302 |  | 7592 | 7419 | 64.72 | 59.45 | 4708 | 4897 | 1888 | 5274 | 5462 | 565 | 5839 | 201 |  | 88 |
| 89 | 6177 | 20 |  | 5652 | 54 | 5302 | 26 | 951 | 4776 | 65.46 | 60．1275 | 1466 | 165 | 184 | 2038 | 222 | 2420 | 261 | 280 |  | 89 |
| 90 | 3550 | 3373 | 319 | 3019 | 2842 | 2665 | 2487 | 2310 | 2133 | 66．1955 | $60 \cdot 8031$ | 822 | 84 | 86 | 8803 | 899 | 9188 | 9381 | 57 |  | 90 |
| 91 | 09 | 07 |  | 0386 | 0207 | ＋028 |  | 9669 | 90 | 66.931 | 61.4787 | 4982 | 51 | 5372 | 5567 | 5762 | 5957 | 6152 | 6347 |  | 91 |
| 92 |  | 8114 | 33 |  | 硣 | 739 |  |  | 6847 | 析 |  | 1740 | 937 | 2135 | 233 | 2529 | 272 | 292 | 析 |  | 92 |
| 93 | 566 | 548 | 5302 | 51 | 4936 | 475 | 4570 | 4387 | 4204 | 68．402 | $62 \cdot 82$ | 8498 | 869 | 889 | 90 | 9295 | 9495 | 969 | 9 | ＋ | 93 |
| 94 | 3041 | 56 | 1071 | 486 | 23 | 2116 | 31 | 1746 | 1561 | 6 |  | 5256 | 545 | 565 | 586 | 6062 | 6263 | 646 | 666 |  | 94 |
| 95 | 0413 |  | ＋040 | 9853 |  | 94 |  |  | 891 | 69 87 | 64.71 | 2014 |  | 242 | 2625 | 2829 | 3032 |  |  |  | 95 |
|  | 715 |  |  | 20 | 7031 | 6842 | 533 | 析 | 矿 |  |  | 8772 | 8978 | ， | 9390 | 9595 | 9801 | －006 | 21 |  | 96 |
| 97 | 515 | 4968 | 47 | 4587 | 4396 | 4205 | 4014 | 3823 | 3632 | $71 \cdot 344$ | $65 \cdot 5322$ | 553 | 573 | 59 | 615 | 6362 | 6570 | 6777 | 6985 |  | 97 |
|  | 2532 |  |  |  | 176 | 156 |  | 182 | 0989 | 72.079 | $66^{2078}$ | 2289 | 249 | 2109 | 2919 | 3129 | 3338 | 354 | 3758 | 3968 | 98 |
|  |  |  |  |  |  |  |  |  | 8346 | 72.815 | $66 \cdot 883$ | 9047 | 925 | 94 | 968 | 989 | ＋107 | 0319 | 0531 |  |  |
| 100 | 7277 | 7081 | 6884 | 6688 | 6491 | 6294 | 6097 | 5900 | 5703 | $73 \cdot 550$ | $67 \cdot 5590$ | 5805 | 6019 | 6233 | 6448 | 6662 | 6876 | 090 | 7304 | 7518 | 100 |
|  | 30 | $29^{\prime}$ | ｜ $28{ }^{\prime}$ | ｜ $27 \times$ | 26 | $25^{\prime}$ | 告 | 23＇ | 22 | 21 | 30 | $29^{\prime}$ | 28＇ | 27＇ | ｜ $26^{\prime}$｜ | 25 | $24^{\prime}$ | ｜ $23^{\prime}$｜ | 22＇ | 21 ${ }^{\prime}$ |  |
| 47 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | NE． |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| $42^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $42^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | $52^{\prime}$ | $53^{\prime}$ | 54 | 55 | $5{ }^{\prime}$ | 57 | 58 | 59 | 50 | 51 | 52 | $53^{\prime}$ | $54^{\prime}$ | $55^{\prime}$ | $56^{\prime}$ | $57^{\prime}$ |  |  |  |
|  | 7333 | 7331 | 7329 | 7327 | 7325 | 7323 | 7321 | 7319 | 7318 |  | 7997 | 680 | 6803 | 6805 | 6807 | 6809 | 6811 | 6814 | 6816 | 6818 |  |
|  | 466 | 466 | 465 | 465 | 465 | 464 | 46 | 463 | 463 |  | 359 | 3602 |  | 3610 |  | 3619 | 3623 |  |  |  |  |
|  | 20 | 199 | 198 | 1982 | 1976 | 197 |  | 1958 | 195 |  |  | 04 | 0409 | 04 | 0422 | 042 | 0434 | 0441 | 04 | 0454 |  |
|  | 9333 |  |  | 9310 |  |  |  | 78 | 92 |  |  | 72 | 7212 | 7220 | 7229 | 7237 | 7246 | 7254 | 263 |  |  |
| 5 | 6667 | 665 | 47 | 6637 | 6627 | 17 | 660 | 659 | 6588 |  |  |  |  | 4025 | 4036 | 4047 | 4057 | 4068 | 4079 | 08 |  |
| 6 | 400 | 3988 | 3976 |  |  | 3941 |  |  |  |  |  |  | 818 | 0830 |  | 085 | 0869 | 088 |  |  |  |
|  | 1333 | ＋ |  | 129 | 127 | 1264 | 12 | 1236 | 1223 | 5.20 | 㖪 | 760 | 76 | 76 | 7650 | 76 | 7680 | 7 | 7710 |  |  |
|  |  |  | 8635 | 8619 | 8603 | 8588 | 857 |  | 8540 | 5.852 | ¢ 4389 |  | 442 | 44 | 44 | 4475 | 4492 | 450 | 4526 | 4543 |  |
|  | 600 |  |  |  |  | 5911 |  | 5875 | 5858 |  |  |  | 122 | 12 | 1265 | 128 | 1303 | 1322 | 1342 |  |  |
| 10 | 3333 | 3314 | 3294 | 3274 | 3254 | 3234 | 3215 | 3195 | 3175 | 73155 | 6.7987 | 8008 | 8029 | 8051 | 3072 | 809 | 8115 | 8136 | 8157 | 8179 | 10 |
| 11 | 06 | 0645 | 06 | 0601 | 0580 | 0558 | 0536 | 0514 | 0493 | 8.047 | 47 | 4809 | 4832 | 4856 | 4879 | 4903 | 4926 | 4950 | 4973 | 499 |  |
| 12 | 8000 | 797 | 7953 | 7929 | 7905 | 7881 |  |  |  |  |  | 1 | 163 | 16 |  | 17 | 8 |  |  | 1814 | 12 |
| 13 | 5333 |  |  |  |  |  |  |  |  |  |  | 84 | 84 | 8466 | 84 | 8521 | 49 | 8577 |  | 8632 |  |
| 14 | 2667 | 263 | 2611 | 2584 | 2556 | 2528 | 250 | 2473 | 2445 | 10.24 | 9.5182 | 52 | 524 | 5271 | 5301 | 5331 | 5361 | 5390 | 5420 | 5450 | 14 |
| 15 | －000 | 997 | 41 | 991 |  | 9852 | 9822 | 9792 | 9763 | 10.9733 | $10 \%$ | 2012 | 204 | 207 | 2108 | 2140 | 2172 | 2204 | 223 | 2268 | 15 |
| 16 | 733 | 73 | 72 | 7239 |  | 7175 | 7143 | 7112 |  | 11 | 10 | 88 | 884 | 8881 | 8915 | 894 | 8984 | 9018 | 9052 | 9086 | 16 |
| 17 | 46 |  |  |  |  |  |  |  |  | 12.4364 | 11.5578 |  | 5650 |  |  |  |  | 831 |  |  | 17 |
| 18 | 200 | 19 | 1929 | 1893 | 1858 | 1822 | 1786 | 1751 | 1715 | 13 | 12. |  |  |  |  |  |  |  |  |  | 18 |
| 19 | 93 |  |  |  |  |  |  |  | 9033 |  | 12.9175 |  | 92 | 92 | 933 | 93 | 9418 | 9458 | 9499 | 953 | 19 |
| 20 |  |  |  |  |  |  |  |  | 6350 | 10 | 13.5974 |  | 6059 | 6102 | 614 | 61 | 622 | 62 | 6315 | 6357 |  |
| 21 |  |  |  |  |  |  |  |  |  | 15.3626 |  |  |  |  |  |  |  |  |  |  |  |
| 22 | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 852 |  |  |  |  |
| 23 | 86 | 86 | 85 | 8530 | 8485 | 8439 | 839 | 8348 | 8303 | 16 | 15.6370 | 641 | 646 | 6517 | 656 | 66 | 6664 | 6 | 6762 | 681 | 23 |
| 24 |  |  |  |  |  |  |  |  |  |  |  | 3220 |  |  |  |  |  | 35 |  |  |  |
| 25 | 33 |  | 3235 | 3185 |  |  |  | 2987 | 2938 |  |  |  |  |  |  |  | 287 |  |  |  |  |
| 26 | 06 |  |  |  |  |  |  |  |  | 19.0204 |  |  |  |  |  |  |  |  |  |  |  |
| 27 | 800 | 79 |  |  |  |  | 76 |  | 757 |  |  | 362 |  |  | 379 | 3852 |  |  |  |  |  |
| 28 | 5334 | 527 | 5223 |  |  |  |  |  |  | 20 | 19.0363 |  |  |  |  |  | 0721 |  | 0840 |  |  |
| 29 | 26 |  |  |  |  |  |  |  |  | 21.215 |  |  |  |  |  |  | 7533 |  |  |  |  |
| 30 | －000 | 9941 | 82 | 9822 | 9763 | 9703 | 964 | 85 | 9525 | 21.9 | 20 | 4024 | 408 | 415 | 421 | 42 | 436 | 408 |  | 53 |  |
| 31 | 73 | 7272 | 7211 | 7150 | 7088 | 7027 | 6965 | 6904 | 6843 | 22．6781 | 21. | 0825 | 089 | 0957 | 1023 | 1090 |  |  |  |  |  |
| 32 | 46 | 460 | 4540 | 447 | 441 | 4350 | 428 | 4224 | 4160 | 23•4097 | 21.7558 |  |  |  |  |  |  | 803 | 8103 |  |  |
| 33 |  |  |  |  |  |  |  |  |  | 24.1412 |  |  |  |  |  |  |  |  | 4919 |  |  |
| 34 | 933 | 9266 | 9199 | 9132 | 9065 | 8997 | 8930 | 8863 | 87 | 24 |  |  |  |  |  |  | 590 |  |  |  |  |
| 35 | 6667 | 659 | 6529 | 645 |  | 632 | 6251 | 6182 | 61 | $25^{\prime} 6043$ | 23.7954 | 302 | 81 | 817 | 8252 | 83 | 8401 |  | 55 | 62 |  |
| 36 | 40 | 3929 | 3858 | 3787 | 3715 | 3644 | 357 | 350 | 3430 | 26.3359 | 24•4753 | 4829 | 490 | 4983 | 5060 | 5136 | 5213 | 5290 | 5366 | 5443 |  |
| 37 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 866 |  | 8517 | 844 |  |  |  |  |  |  | 25.8350 |  |  |  |  |  |  |  |  |  |  |
| 39 | 600 | 5923 | 5846 |  |  |  |  | 546 | 538 | 28.5305 | 26.5149 |  |  |  |  |  |  |  | 5813 |  |  |
| 40 | 33 | 3255 | 3176 | 3096 | 3017 | 2938 | 2859 | 2779 | 2700 | 29 | 27－19 | 2033 | 211 | 2203 | 2288 | 2374 | 24 | 2544 | 262 | 271 | 40 |
| 41 | 0667 | 0586 | 0505 | 0424 |  |  | 018 |  | ． 018 | 29.9936 | $27 \cdot 8746$ | 883 |  |  |  | 9183 | 9270 | 9358 |  |  |  |
| 42 |  |  |  |  |  |  |  |  |  | $30 \cdot 7252$ |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 53 | 52 | 5164 | 507 |  |  | 482 |  | 465 | 31．4567 | 23 |  |  |  | 271 | 280 | 289 | 298 | 076 |  |  |
| 44 | 26 | 25 | 2493 | 2406 |  |  |  |  |  |  | 29.91 |  |  |  |  | 96 |  |  | 89 |  |  |
| 45 | \＄001 | 991 | 9822 |  |  |  |  | 9377 |  | 32.9198 | 30.5941 |  |  | 6229 |  | 6420 | 651 | 6612 | 6708 | 88 |  |
| 46 | 7334 |  |  |  |  |  |  |  |  |  | 31．27 |  |  |  |  |  |  |  |  |  |  |
| 47 | 46 |  | 4481 |  |  | 420 |  |  |  | 34．382 | 31.9538 |  |  |  |  |  |  |  |  |  |  |
| 48 | 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 49 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | 6667 | 6568 |  | 637 | 627 | 6172 | 607 | 5974 | 5875 | 36.5776 | 33.9934 |  | 0147 | 0254 | 0360 | 046 | 0573 | 068 | 0786 | 8993 |  |
| 51 | 400 |  |  |  |  |  |  |  |  |  | 34．6733 |  |  |  |  |  |  |  |  |  |  |
| 5 | 13 | 12 |  |  |  |  |  |  |  |  | ． 35 |  |  |  |  |  |  |  | 4418 |  |  |
| 53 | 86 | 85 |  |  |  |  |  |  | 78 | ＇77 |  |  |  |  |  | 0895 |  |  |  |  |  |
| 54 | 6001 |  | 5787 | 568 |  |  |  | 5252 | 514 | 39.503 |  |  |  |  |  | 7704 |  |  |  |  |  |
| 55 | 333 | 322 | 311 | 3007 |  |  |  |  | 246 |  | $37 \cdot 39$ |  |  | 427 |  | 4514 |  | 47 | 4865 |  |  |
| 56 | 066 |  |  |  |  |  |  |  |  |  |  |  |  |  | 1204 |  |  |  |  |  |  |
| 57 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 59 | 266 | 255 | 34 | 231 | 00 | 2083 | 1967 | 1850 | 173 | 43.16 | $40 \%$ | 124 | 1374 | 1500 | 16 | 175 | 187 | 2002 | 212 | 225 |  |
| 60 | ＋00 | 9882 | 9763 | 964 | 9526 |  | 9288 |  |  | 43. | $40 \cdot 79$ |  | － |  |  |  |  | 8816 | 8944 | 907 |  |
| 6 | 733 |  |  |  |  |  |  |  |  |  | 41 |  |  |  |  |  |  |  |  |  |  |
| 62 |  |  |  |  |  |  |  |  |  |  | 42 |  |  |  |  |  |  |  |  |  |  |
| 63 | 20 |  |  |  |  |  |  |  |  | 46.08 | 4．831 |  |  |  |  |  |  |  |  |  |  |
| 64 | 9338 | 9207 | 908 |  |  |  |  |  | 83 | 46 | $43 \cdot 5$ | 52 |  |  |  |  |  |  |  |  |  |
| 65 |  |  |  |  |  |  |  |  |  |  | $44 \cdot 1$ |  |  |  |  |  |  |  | 3022 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | 866 | 853 | 839 | 826 | 8129 | 79 | 7860 |  | 759 | 49. | $46^{\circ}$ | 24 | 2600 |  |  | 303 |  | 33 | 347 |  |  |
| 6 |  |  |  |  |  |  |  |  |  | 50．4771 | 46.91 | 925 | 9403 |  |  | 984 |  | －1 | 285 |  |  |
| 70 |  |  |  |  |  |  |  |  |  | 51 | 47.59 | 60 |  |  |  | 析 |  |  | 7101 | 725 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 800 |  | 7716 | 75 | 7431 | 72 | 7146 |  | 68 | $52 \cdot 6$ | 48.95 |  |  |  |  |  |  |  |  |  |  |
| 7 | 533 | 5190 | 504 |  |  | 4612 | 4467 |  | 4178 | 53：40 | 49.630 | 645 | 66 | 675 | 69 | 708 |  | 739 | 7548 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 26 | 441 |  |  |  |  |  |  |  |  |
| 75 | ． 001 | 53 | 970 | 95 | 9407 | 925 | 9110 |  | 8813 | 54．866 | 50 |  | 研 |  |  | 70 |  | 102 | 180 |  |  |
| 76 | 7334 |  | 7033 |  |  | 658 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 77 | 4668 | 451 | 4363 | 421 | 4058 | 39 | 3753 |  | 344 | $56 \cdot 32$ | 52．3498 | 366 | 382 | 399 | 4 | 431 | 448 | 464 | 481 |  |  |
|  | 20 |  |  |  |  |  |  |  | 寿 | 57．061 | $53^{\circ} 02$ | 0463 |  | 07 |  | 112 | 129 | 46 | 627 | 1871 |  |
| 79 | 9334 | 寿 |  | 8865 | 8709 | 855 | 8396 | 8239 | 8083 | 57．7926 | 53 | 7264 | 7433 | 760 | 7770 | 7938 | 810 | 27 | 8443 |  |  |
| 80 | 666 | 6509 | 635 | 6193 | 6034 | 5876 | 5717 | 5559 | 540 | 58.5242 | 54．389 | 406 | 423 | 440 | 457 | 474 | 491 | 508 | 525 |  |  |
| 81 | 400 |  | 3680 | 3520 |  | 319 | 3039 | 2878 | 2718 |  | 55 | 086 | 103 | 121 | 1384 | 556 |  | 硡 |  |  |  |
| 82 | 13 |  | 1010 |  |  |  | 0360 |  | －035 | 㖪 | 55.749 |  | 78 | 801 |  |  |  | 8715 | 8890 |  |  |
|  | 8668 |  |  | 矿 | 8011 |  |  |  |  |  |  |  | 464 | d82 | 矿 | 矿 |  | 5529 | 5 |  |  |
| 8 | 6001 | 5835 | 5669 | 5502 | 5336 | 517 | 5003 | 483 | 4670 | 61.4504 | 57•108 | 126 | 144 | 162 | 18 | 198 | 21 | 2342 | 252 |  |  |
| 85 | 333 | 3166 | 2998 | 2830 | 2661 | 2493 | 2325 | 21 | 1988 | 62. | $57 \cdot 788$ | 8069 | 825 | 84 | 8613 | 379 | 897 | 915 | 933 |  |  |
|  | 06 |  |  |  |  | 9817 |  |  |  |  | 58.468 | 487 | 5053 | 2037 |  | 5603 |  | 5970 | 615 |  |  |
|  | 8001 |  |  |  | 12 |  |  | 679 | 6623 |  |  |  |  |  |  | 4， |  |  |  |  |  |
| 88 | 5334 |  | 4986 | 4812 | 4638 | 446 | 4289 | 4115 | 3940 | 64•3766 | 59.8 | 847 | 865 | 884 | 9034 | 922 | 920 | 9597 | 9784 |  |  |
| 89 | 266 | 2492 | 2316 | 2139 | 1963 | 1787 | 161 | 1434 | 1258 | 65．1081 | $60 \cdot 508$ | 527 | 5462 | 56 | 58 | 603 | 62 | 6410 | 660 |  |  |
| 90 | － | 9823 | 9645 | 9467 | 9289 | 9110 | 8932 | 8754 | 8575 | 8397 | $61 \cdot 1881$ | 207 | 226 | 245 | 2649 | 2841 | 3032 | 322 | 34. | 360 |  |
| 91 | 73 |  | 230 |  |  |  |  |  |  |  |  |  | 888 |  |  | 9650 |  |  |  |  |  |
| 92 | 4668 | 4486 | 4304 | 4，22 |  | 3 | 硣 | 3393 | 210 |  | 22 |  | 析 |  | 6263 | 45 | 665 | 685 | 24 |  |  |
| 93 | 200 | 1817 | 163 | 1449 | 1265 | 10 | 085 | 071 | 052 | 68.034 | 63．2277 | 2476 | 2674 | 28 | 307 | 326 |  | 36 | 386 | 403 |  |
|  | 9334 | 48 | 8962 | 76 | 析 | 8404 | 218 | 032 | 7845 |  | 9076 | 276 | 947 | 967 |  | ＋07 | 27 | 047 | 067 |  |  |
| 95 | 6668 | 2480 | 6292 | 61 | 5916 | 5728 | 5539 | 5351 | 5163 | 497 | 645875 | 67 | 280 | 688 |  | 688 | 7090 | 7292 | 49 | 769 |  |
|  | 4001 | ， | 3621 | 431 | 仡 | 3051 | 2861 |  | 2480 |  |  | 878 | 3083 | 3287 |  | 697 | 3901 | 4106 | ， |  |  |
|  | 13 |  | 095 | 07 | 05 | 037 | 182 | 99 | 979 | 70 | $65 \cdot 9472$ | 967 | 9886 | － | 02 | 050 | 0712 | ， | 1126 |  |  |
|  | 8668 | 8474 | 8280 | 8086 | 7892 | 7698 | 7504 | 7310 | 7115 | $71 \cdot 6921$ | $66^{6271}$ | 6480 | 6689 | 6898 | 7106 | 7315 | 7524 | 7733 | 794 | 81 |  |
|  | 6001 | 585 | 5609 | 541 | 521 | 5021 | 4825 | 4629 | 4433 | 72.4237 | 67•3069 | 328 | 349 | 370 | 391 | 412 | 433 | 454 | 475 | 4968 |  |
| 100 | 3335 | 3137 | 2939 | 274 | 254 | 2345 | 2147 | 1949 | 1750 | 73．1552 | $67 \cdot 9868$ | －08 | 029 | 050 | 072 | 093 | 114 | 136 | 157 | 178 |  |

TRAVERSE TABLES.

| 43 |  |  |  |  | Cosine. |  |  |  |  |  | Snne. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | $3^{\prime}$ | , | , |  |  |  |  |  |  |  |  | $4{ }^{1}$ |  |  |  |  |  |  |
|  | 7314 | 7312 | 73 | 7308 | 7306 | 73 | 7302 | 7300 | 7298 | 729 | . 6820 | 6822 | 6824 | 6826 | 6828 | 6831 | 33 | 35 | 6837 | 839 |  |
|  | 4627 | 46 | 4619 | 4615 | 4611 | 4607 | 4603 | 4599 | 4595 | 1.45 | 1.36 | 3644 | 3648 | 53 | 57 | 51 | 55 | 70 | 74 |  |  |
|  | 1941 | 19 |  | 19 | 1917 | 191 | 1905 |  |  | 2.18 | . 04 | 0466 | 0473 | 0479 | 048 | 0492 | 0498 | 05 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 7297 | 7305 |  | 7322 |  |  |  |  |  |
|  | 6568 |  |  | 6538 | 6528 | 6518 | 6508 | 6498 |  |  |  | 41 | 412 | 41 | 4142 | 4153 |  |  |  |  | 5 |
|  | 3881 | 1 | 38 |  | 138 |  | 3810 |  | 37 | 4.37 | 4.0 | 0933 | 0945 | ${ }^{0958}$ | 0971 | 84 | 0996 |  |  |  |  |
|  |  |  |  |  |  | 1125 | 1111 |  |  |  |  | 7755 |  | 7785 |  |  |  |  |  |  |  |
|  | 85 |  |  |  |  |  |  |  |  |  |  | 45 | 4594 | 4611 |  |  |  |  |  |  |  |
|  | 5822 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9 |
| 10 | 兂 |  |  |  |  |  |  |  |  |  |  | 8221 | 8262 | 8264 | 8285 |  |  | 8349 | 3370 |  | 0 |
| 11 | 0449 | 04 | 04 | 0383 | 0362 | 0340 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 3 3 |
| 13 | ${ }_{230} 5$ |  | ${ }_{2334}^{5324}$ |  |  | 22 | 22 | 21 | 21 |  |  | 5510 | 55 |  | 5599 | 8798 5629 | 8826 5658 | 8888 | 5718 |  | 4 |
| 15 | 9703 | 96 | 9644 | 9614 | 9584 | 9554 | 9524 |  |  | 10 | 102 | 2332 | 2364 | 2395 | 2427 | 2459 |  | 253 | 2555 |  |  |
| 16 | 70 | 69 | 69 | 6921 | 6890 | 6858 | 6826 | 6794 | 67 | 11 | 10 | 915 | 9188 | 9222 | 9256 | 9290 | 19324 | ${ }^{9358}$ | 9392 |  | 16 |
| 17 | 433 | 4296 | 4263 | 4229 | 4195 | 4161 | 4128 | 4094 | 40 |  |  | 59 | 6012 | 6048 | 60 | 6120 | 6157 | 6193 |  |  |  |
|  |  |  | 1572 |  |  |  |  |  | 1358 | 13 | 12 | 2798 |  | 2875 | 29 | 291 |  |  |  |  | 18 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 19 |
| 20 | 6271 |  | 61 | 6152 | 61 | 6072 | 6032 |  |  | 14.59 |  |  |  |  |  |  | 5 |  | 6740 |  | 0 |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 21 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 82 | 81 | 81 | 80 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 23 |
| 2 | 55 | 547 | 5430 |  |  |  |  | 51 |  |  |  | 3731 |  | 3833 |  |  |  |  |  |  | 24 |
| 25 | 283 | 27 | 2739 |  |  |  |  |  |  | 18.23 |  |  |  |  |  |  |  |  |  |  |  |
| 26 | 015 | 01 | 10 | 9997 | 9946 | 9894 | 9842 | 9791 | 9739 | 18.96 | 17.7320 | 7375 |  |  | 754 |  |  |  |  |  | ${ }^{26}$ |
|  | 74 | 74 |  | 7305 |  |  |  |  |  |  | 19. | 4197 | 4254 | ${ }^{6312}$ |  |  | 448 |  |  |  | ${ }_{28}^{27}$ |
| $28$ |  | 47 | 4668 | 46 | 4557 | 45 | 4445 | 4390 | 43 | 20.4 21.1 | 19.09 1977 | 1019 | 790 | 7965 |  |  |  |  |  |  | ${ }_{28}^{8}$ |
| 32 | 240 |  |  | 1922 | 1862 | 1808 | 9049 | 89 | ${ }_{8929}$ | 1 | 20.4600 | 4663 | 1727 | 479 | 485 | 491 | ${ }_{4}^{18149}$ |  |  |  | 0 |
|  |  | 6658 | 6597 | 6535 | 6474 |  |  |  |  |  | $2 \cdot$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 365 | 35 | 35 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3 |
|  | 86 | 85 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 34 |
| 35 | 59 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 328 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 060 | 05 | 04 | 03 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | 525 |  |  | ${ }_{2303}^{4996}$ |  | 2144 | 2065 | 1985 | 1906 | 29 | 27.57999 |  | $6145$ |  | $\begin{array}{r} 1 / 40 \\ \hline \end{array}$ | $\begin{array}{r} 394 \\ 3225 \\ \hline \end{array}$ | 3310 | 3394 |  | 3564 |  |
| 41 | 98. |  |  |  |  |  | 93 | 9285 | 9203 | $29 \cdot 9$ |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }_{45}^{44}$ |
| 45 | 910 | 90 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 33.56 | $31 \cdot 37$ |  |  |  |  |  |  |  |  |  | 46 |
|  |  | 36 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 47 |
|  | 103 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 48 |
| 50 | 836 567 | 8578 |  |  |  |  |  | 4982 | 4882 | 36.478 |  | 110 | 1212 |  | 1424 | 1531 | 163 | 1743 | 184 |  |  |
|  | 297 | 28 |  | 2687 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 52 |
|  |  |  |  |  | 4502 |  | 42 | 4881 | 407 | 38.684 | 36 |  |  | 86 |  |  |  |  |  |  | 54 |
|  | 2245 | 213 | 2026 | 19 | 1808 | 1699 | 158 | 148 | 1371 | 40.12 | 37-509 | 52 | 53 | 54 | 5567 |  |  | 5917 |  |  | 55 |
|  | 9558 | 96 | 9336 | 9225 | 9113 | 9002 | 88 |  |  | 40 | 38.19 | 203 |  |  |  | 2514 | 263 | 275 | 287 |  | 56 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 41 | 40 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 58 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 59 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ${ }^{970938}$ | 9837 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 | 07 | 06 |  |  | 0253 | 01 |  |  |  | 45 | $42 \cdot 9$ |  |  |  |  |  |  |  |  |  |  |
|  | 8066 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 7295 | 743 | 756 |  |  |
| 65 | 5380 | 5251 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5 |
| 66 | 2693 |  | 2731 |  |  | 2038 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 67 |
| 68 |  |  |  |  |  |  | ${ }^{92}$ | $\begin{aligned} & 9776 \\ & 6375 \end{aligned}$ | $\begin{aligned} & 894 \\ & 624 \end{aligned}$ |  | 46-3 |  |  |  | 433 | ${ }_{4}^{7651}$ | 462 | 477 | 491 |  | 68 |
| $\begin{aligned} & 68 \\ & 69 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  | $4{ }_{4}{ }^{4}$ |  |  |  | 116 | 131 | 145 | 160 | 1752 |  |  |
| 70 | 1948 |  |  | 1531 | 1392 |  | 114 | 097 |  | 51.08 | 4773 | 754 | 769 | 784 | 799 | 8143 | 829 | 8440 | 85 |  |  |
| 71 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4823 | 4 |  | 5275 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 49.1 |  |  |  | 1651 | 18 |  | 2110 |  |  |  |
|  | 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 75 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 75 |
|  | 58 | 5678 | 5527 |  | 523 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3142 |  | 2837 |  |  | 2378 | 222 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 78 |  |  |  |  |  |  |  |  |  | $57 \cdot 63$ | 53.1959 53 |  |  | 24 |  |  |  |  |  |  |  |
| 80 | 5083 | 4924 | 4765 | 4607 | 4448 | 428 | 4130 | 3971 | 3812 | 58.36 | 54.559 | 576 | 593 |  | 6279 | 6449 | 6619 |  |  |  |  |
|  |  |  |  |  |  |  |  | 1270 | 110 |  |  | 259 |  | 293 | 3108 | 3280 |  | ${ }^{3624}$ |  |  |  |
|  |  |  |  | 92 |  |  |  |  |  |  |  |  |  |  |  |  | 028 | 045 | 063 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 84 | 4337 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 | 1651 |  | 1313 | 1145 |  | 080 | 0638 | 0469 | 0300 |  | 57.9 | 987 |  | 241 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 62.7 | 58 |  |  | 706 |  | 743 | 761 | 7798 | 798 |  |  |
|  | 623 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3591 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8989 | 82 | 3040 |  | 7682 | 750 | 7325 | 7146 | 696 | 6788 | 65.66 | 61.37 | 399 | 4181 | 437 | 4564 | 475 | 494 | 513 | 532 | 5520 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 2663 | 2480 | 2298 | 2115 | 1932 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | ${ }_{6353} 9$ |  |  |  | 63.4259 | ${ }_{127}^{44}$ | 147 |  | 1878 |  |  |  |  |  |  |
|  | 47 | 45 |  |  | 4032 | 384 | 365 | 346 | 327 | 69.30 | 64789 | 810 | 830 | 85 | 870 | 8908 | 9110 | 931 | 95 | 19715 | 95 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1354 | 1155 |  | 3451 | 0560 | 0361 | 62 | 64 | 9765 | ${ }_{72}{ }^{72956}$ | 681998 | 2211 | 2624 | 2636 | 284 | 3061 | 3274 | 348 | 369 | 391 | 100 |
|  |  |  |  | ³7 | 56 | 55 | $54^{\prime}$ | $53^{\prime}$ |  | $151^{1}$ |  |  |  | $57^{\prime}$ | 56 | $55^{\prime}$ | $\left.\right\|^{54}$ \| |  |  | 51 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## TRAVERSE TABLES．

| $43^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $43^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11^{\prime}$ | 12 | 13 | $14^{1}$ | $5^{\prime}$ | $1{ }^{\prime}$ | 17＇ | $18^{\prime}$ | 19 | 10 | 11 | 12 | 13 | 14 | $15^{\prime}$ | $16^{\prime}$ | 17 | 18 | $19^{\prime}$ |  |
|  | 7294 | 7292 | 7290 | 7288 | 728 | 7284 | 7282 | 728 | 7278 | 7276 | 6841 | 6843 | 6845 | 6848 | 6850 | 6852 | 6854 | 6856 | 6858 | 6860 |  |
|  | 458 | 4583 | 4579 | 45 | 457 | 45 | 4563 | 455 | 455 | 45 | －3682 | 368 | 369 | 368 |  | 3704 | 3708 | 3712 | 左 |  |  |
|  | 188 | 1875 | 186 | 18 | 1857 | 185 | 1845 | 1839 | 18 | $2 \cdot 18$ | 2.0524 | 0530 | 0536 | 0543 | 05 | 05 | 0562 | 0568 | 0575 | 05 |  |
|  | 9175 | 9167 | 9159 | 915 | 9143 | 913 | 9127 | 9119 | 911 |  |  | 737 | 73 | 7390 | 73 | 7407 | 7416 | 24 | 7433 | 744 |  |
|  |  |  |  |  | 6429 | 6419 |  | 6399 | 6389 | 3.6379 | 3.4206 | 4217 | 422 | 423 | 42 | 4259 | 4270 |  | 429 | 430 |  |
| 6 | 3762 | 3750 | 3738 | 3726 | 3714 | 3702 | 3690 | 3678 |  | $4 \cdot 365$ |  | 1060 | 1073 | 1086 | 1098 |  | 1124 |  | 1149 |  |  |
|  | 105 | 104 | 1028 | 1014 |  |  |  |  | 0 |  |  |  | 791 | 7933 |  | 79 |  | 7992 | 8007 |  |  |
|  | 83 | 83 | 8317 | 8302 | 8286 | 827 |  |  | 82 | 5.82 | 5.4730 | 4747 | 476 | 478 | 47 | 4815 | 4832 | 4849 | 486 | 48 |  |
|  | 564 | 562 | 5607 |  | 5571 | 5553 | 5535 |  | 5500 |  |  | 1590 | 160 | 16 | 16 | 16 | 1686 | 1705 | 172 | 17 |  |
| 10 | 2937 | 2917 | 2897 | 2877 | 2857 | 2837 | 2817 | 2797 | 777 | 7.2757 | 6.8412 | 8434 | 8455 | 8476 | 8497 | 8518 | 8539 | 856 | 8582 | 8603 | 0 |
| 11 | 0230 | 020 | 01 | 0165 | 0143 | 0121 | 0099 | 0077 | 0055 | 8.003 | 7.5254 | 5277 | 5300 | 5324 | 5347 | 537 | 5393 | 5417 | 5440 | 5463 |  |
| 12 | 75 |  |  |  |  |  |  |  |  |  | 2095 |  | 214 | 217 | 2197 | 22 | 2247 | 2273 | 2298 | 23 | 12 |
| 13 | 4818 | 47 | 4766 |  |  | 4688 | 4662 | 4636 | 4610 | 9.458 |  |  | 899 | 90 |  | 9074 |  | 9129 | 9156 | 91 | 13 |
| 14 | 2111 | 2083 | 2056 | 202 |  |  | 1 | 1916 | 1888 | $10 \cdot 18$ | 577 | 5807 | 5837 | 586 | 589 | 5926 | 59 | 5985 | 6015 |  |  |
| 15 | 940 |  |  |  |  |  |  |  |  | 10 | 10.2 | 2650 | 268 | 2714 | 2746 | 77 | 2809 | 2841 | 2873 | 2905 | 5 |
| 16 | 669 | 6667 | 6635 | 6603 | 6571 | 6539 | 6507 | 6476 | 64.4 | 11.641 | 10.9460 | 9494 | 9528 | 9561 |  | 9629 | 9663 | 9697 |  |  | 16 |
| 17 | 399 | 39 |  | 389 | 385 | 382 | 37 | 37 | 372 | 12 | 11. | 63 | 63 | 64 |  | 6481 | 6517 | 65 | 6589 | 662 | 17 |
| 18 | 128 | 1250 | 1 | 1179 |  | 1107 |  | 1035 | 0999 | 13 | 12 | 31 | 321 | 325 |  | 33 | 337 |  | 3447 |  | 18 |
| 19 | 858 | 85 | 8504 | 8466 | 842 | 8390 | 8353 | 8315 | 8277 | 13. |  | －024 | 00 | 010 | 01 | 0185 | 022 | 026 |  |  |  |
| 20 | 5873 | 5834 | 5794 | 5754 | 5714 | 567 | 56 | 5 | 5555 | 14.55 | 13.682 | 6867 | 690 | 695 | 699 | 703 | 7079 | 712 | 716 | 206 | 20 |
| 21 | 31 | 3125 | 3083 | 3042 | 3000 | 295 | 2916 | 2874 | 2832 | 15.279 | 14 | 3710 |  |  | 3844 | 38 | 393 | 397 | 4022 | 406 | 21 |
| 22 | 04 |  |  |  |  |  |  |  |  | 16.00 | 15.0507 |  |  |  |  | 0740 |  |  |  |  | 2 |
| 23 | 775 | 77 | 7663 | 76 | 75 | 75 | 7479 | 7434 | 73 | 16 | 15.73 | 739 | 74 | 74 | 7 | 75 | 7641 | 7690 | 773 | 77 | 23 |
| 24 | 504 | 50 | 2 | 49 | 48 |  |  |  | 46 | 17 | 16 | 42 | 429 | 43 |  | 4444 | 4495 |  |  |  |  |
| 25 | 23 | 2292 | 42 |  | 2143 |  |  |  |  |  |  |  | 1137 | 1190 | 1243 | 1296 |  |  |  |  | 25 |
| 26 | 9635 | 9584 | 9532 | 9480 | 9428 | 9376 | 9325 | 9273 | 9221 | 18.916 | $17 \cdot 7872$ | 7927 | 7982 | 8037 | 8092 | 8148 | 8203 | 825 | 8313 | 836 | 26 |
| 27 | 69 | 6875 | 6822 | 6768 | 671 | 666 |  |  |  |  | $18^{\circ}$ |  | 4828 | 48 |  | 4999 | 5057 |  |  |  | 27 |
| 28 | 42 | 416 |  |  |  |  |  |  |  | $20 \cdot 37$ | 19.1 |  |  | 1733 |  | 1851 |  |  |  |  |  |
| 29 | 15 | 145 | 140 | 1343 |  | 122 |  | 1112 | 1054 | 21.0 | 19. | 845 | 851 | 8580 | 8642 | 870 | 8764 | 8826 | 888 | 894 | 29 |
| 30 | 8810 | 8750 | 86 | 8631 | 8571 | 8511 | 8451 | 8392 | 332 | 21.827 | $20 \cdot 52$ | 530 | 53 | 54 | 54 | 555 | 561 | 568 | 57 | 580 | 30 |
| 31 | 61 | 604 |  | 591 | 585 |  |  |  |  | 22.55 | $21 \cdot 2078$ |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 339 |  | 5270 | 320 | 31 |  |  |  |  |  |  |  | 905 |  |  |  |  |  |  |  |  |
| 33 | 069 | 0625 | 0560 | 0494 | 0 | 0362 | 0297 | 0231 | 0165 | 24.0 | $22 \cdot 5761$ | 583 | 59 | 59 |  | 6110 | 6180 | 625 | 63 |  |  |
|  |  | 791 |  | 7782 |  |  |  |  |  | 24.73 | 23.2602 | 26 | 2746 | 28 |  | 2962 | 3034 |  |  |  |  |
| 35 | 527 | 520 |  | 506 | 500 | 493 | 48 | 4790 | 4720 |  |  | 95 | 959 | 9666 | 9740 | 981 |  | 96 |  |  | 35 |
| 36 | 257 | 2500 | 2429 | 2357 | 2285 | 22 | 2142 | 2070 | 1998 | 26．192 | 24．6284 | 636 | 643 | 651 | 6590 | 6666 | 6742 | 6818 |  |  | 36 |
| 37 | 98 | 9792 | 9718 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 | 715 | 7084 | 700 | 693 |  |  |  | 6629 | 655 | 27. |  |  |  |  |  |  |  |  |  |  |  |
| 39 | 445 | 4375 | 4298 | 422 | 4142 | 406 |  |  | 383 | 28 |  | 689 |  |  |  | 722 | 7304 | 738 | 746 |  |  |
| 40 | 17 | 1667 | 1587 | 1508 | 1428 | 1348 | 1269 | 1189 | 1109 | 29 | $27 \cdot 3649$ | 373 | 3819 | 3904 | 3988 | 4073 | 4158 | 4243 | 4327 | 4412 | 40 |
| 41 | 90 | 8959 | 8877 | 879 |  | 863 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 633 | 625 | 6167 |  | 600 |  |  |  |  | ， |  | 74 |  |  |  |  |  |  |  |  | 42 |
| 43 | 36 | 35 | 3456 | 337 | 3285 | 3200 | 3114 |  |  | 31 | 29．4173 | 42 | 43 | 44 | 4538 | 4629 | 4720 | 48 | 4902 |  | 43 |
| 44 | 092 | O834 | 0746 | 065 |  |  |  |  |  | 32 |  |  |  |  |  |  | 1574 | 166 |  |  |  |
| 45 | 821 | 812 | 8036 |  |  | 7767 |  |  |  | 32.7 | $30 \cdot 7$ | 795 | 804 |  | 823 | 833 | 8428 | 8523 | 8618 | 87 | 45 |
| 46 | 55 | 5417 | 5326 |  |  |  |  |  |  |  | 31.4697 |  |  |  |  |  |  |  |  |  | 46 |
| 47 |  |  |  |  |  |  |  |  |  |  | 32 | 1637 |  |  |  | 2036 |  |  |  |  |  |
| 48 | 00 | ${ }^{1}$ | 990 | 980 | 97 | 9618 |  | 9427 | 933． | 34 | 32 | 848 | 85 | 86 |  | 88 | 899 |  |  |  |  |
| 49 | 73 |  |  |  |  |  |  |  |  |  | 33 | 53 |  |  |  |  |  | 59 |  |  | 49 |
| 50 | 468 | 4584 | 4484 | 4385 | 4285 | 4186 | 4086 | 3986 | 3886 | 36.3787 | 34 | 2168 | 2274 | 2380 | 2486 | 2592 | 2697 | 280 | 290 | 3015 | 50 |
| 51 | 197 | 1876 | 1774 |  |  |  |  |  |  | 37•106 | 34：8903 |  |  |  |  |  |  |  |  |  |  |
| 52 | 927 | 916 |  |  |  |  |  |  |  | 37 |  |  |  |  |  |  |  |  |  |  | 52 |
|  | 656 | 6459 | 6353 |  | 6142 | 60 | 5931 | 5825 | 5720 | 38.56 | 36．25 |  | 2810 |  |  | 3147 | 325 |  |  |  |  |
| 54 | 385 | 3751 |  |  | 3428 | 3320 | 3213 |  | 299 | 39. |  | 95 | 96 | 97 |  | 999 | 11 | 022 |  |  | 54 |
| 55 | 1152 | 1042 | 933 |  |  |  |  |  |  |  | 37 |  |  |  |  |  |  |  |  |  | 55 |
| 56 | 844 |  | 8222 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 57 |  | 5512 |  | 5285 |  |  | 4944 |  | 41.47 | 38.9950 |  |  |  |  |  |  |  |  |  |  |
| 58 | 303 | 291 | 2802 |  | 257 | 24 |  | 2224 | 21 | $42 \cdot 1$ | 39 |  |  |  |  |  |  |  |  |  |  |
| 59 |  |  |  |  |  |  |  |  |  |  | 40.36 |  |  |  | 4133 | 425 | 438 | 45 |  |  |  |
| 60 | 76 | 7501 | 7381 | 7262 | 7142 | 7023 | 6903 | 6783 |  | 43.654 | 41.0474 | 060 | 0728 | 0855 | 0983 | 111 | 123 | 136 | 149 | 16 | 60 |
| 61 | 49 |  | 467 |  |  | 430 |  |  |  |  | 41 |  |  |  |  |  |  |  |  |  |  |
| 62 | 220 |  |  |  |  |  |  |  |  |  | 42.4 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 8622 |  | 837 | 43.09 |  |  |  |  |  |  |  |  |  |  |
| 64 | 679 | 666 | 6540 | 6412 |  | 6157 |  |  |  | $46 \cdot 56$ | 43.7 |  |  | 82 |  | 85 | 86 |  |  |  |  |
| 65 | 40 | 3959 |  |  |  |  |  |  |  | $47 \cdot 29$ | 44＊468 |  |  |  |  |  |  |  |  |  | 65 |
| 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 596 | 58 | 56 | 556 | 5428 |  | 5157 | 5021 | 488 | 49.475 | $46 \cdot 52$ | 53 | 543 | 5636 |  | 592 |  |  |  |  |  |
| 69 |  |  |  |  |  |  |  | 2301 |  |  |  |  |  |  | 2630 | 277 | 977 |  |  |  |  |
| 70 | 055 | 0417 | 0278 | －1 | 99 | 9860 | 720 | 958 | 441 | 50.93 | 47－888 | 903 | 918 | 933 | 948 | 962 | 977 | 929 | 10 | 02 | 0 |
| 71 | 78 | 7709 | 75 | 74 | 728 | 7143 | 7002 | 6860 | 6719 | 51.65 | 48.572 | 587 | 6 | 61027 |  | 648 |  | 678 |  |  | 71 |
| 72 | 51 |  | 4857 |  |  |  |  | 4140 |  | 52．38 | 49.25 |  |  |  |  | 3332 |  |  |  |  |  |
|  | 243 | 2292 | 2147 |  | 1856 | 17 | 1565 | 1420 | 1274 | 53.112 | 49.94 | 956 | 971 | 98 | ＋029 | 018 | 033 | 048 | 06 | 08 | 73 |
| 74 | 97 | 9584 | 9437 | 928 |  |  | 8847 | 8699 | 85 | 53.84 | $50 \cdot 625$ | 6 | 65 |  | 6879 | 703 | 71 | 73 | 75 |  | 74 |
| 75 | 702 | 68 | 6726 | 657 |  |  |  |  |  |  | $51 \cdot 309$ |  |  |  |  |  |  |  |  |  |  |
| 76 | 43 |  |  | 386 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 77 | 1612 | 1459 | 1306 | 115 | 09 | 08 | 06 | 053 | 038 | 56.02 | $52 \cdot 677$ | 693 |  | 726 | 742 | 759 | 775 | 79 |  |  |  |
| 78 | 89 | 8751 | 85 |  |  |  | 7974 |  | 7663 | 56.75 | 53.361 | 378 | 9947 | 4112 | 427 | 444 | 460 | 477 |  |  |  |
|  | 620 | 6042 |  | 5728 | 55 | 513 | 5256 | 098 | 4941 | 57.478 | 54.045 | 0625 | 0792 | 0960 | 1127 | 129 | 146 | 162 | 17 | 1 |  |
| 80 | 3493 | 3334 | 3175 | 301 | 2856 | 2697 | 2537 | 378 | 221 | 58.205 | 54.7298 | 7468 | 763 | 7807 | 7977 | 814 | 83 | 8485 | 8655 | 882 | 80 |
| 81 | 07 | 0626 | 04 | 0303 | ¢142 | 9981 | 9819 | 9657 | 9496 | 58.93 | 55.414 | 43 | 44 | 46 | 4827 | 49 | 517 | 534 | 55 |  |  |
| 82 | 80， |  |  | 781 |  | 析 | ， | 6937 | 678 | 59.661 |  |  | 1329 | ， | ¢ | 185 | 2028 | 硣 |  |  |  |
| 83 | 5374 | 5209 | 5044 | 4879 | 4713 | 4548 | 4382 | 4217 | 4051 | $60 \cdot 388$ | 56.78 | 799 | 8174 | 83 | 8526 | 870 | 887 | 905 | 921 |  | 83 |
| 84 | 2668 | 2501 | 34 | 2166 | 1999 | 1832 | 1664 | 1497 | 1329 | $61 \% 116$ | 57：466 | 4841 | 502 | 59 | 537 | 555 | 573 | 5910 |  |  | 84 |
| 85 | 9962 |  |  |  |  |  |  |  |  | － |  | 1685 |  | 20 | 22 | 2506 | 258 | 276 |  |  | 85 |
| 86 | 7255 | 834 |  |  |  |  | 888 | 6056 |  |  |  | 85 |  | 8893 | ， | 925 | 析 | 922 |  |  | 86 |
| 87 | 4549 | 4376 | 42 | 402 | 3856 | 3683 | 35 | 333 | 3162 | 63.298 | 59.51 | 53 | 55 | 5740 | 592 | 610 | 629 | 64 |  |  | 87 |
| 88 | 1843 | 1668 | 8702 |  |  |  |  | \％ |  |  |  | 221 | 240 | 硅 | 275 | 296 | 14 | 333 |  |  | 88 |
| 8 | 9136 | 8959 | 8782 | 860 | 842 | 8250 | 8073 | 789 | 7718 | 64.754 | $60 \cdot 886$ | 905 | 924 | 94 | 9624 | 9813 | 400 | 01 | 03 | 05 | 89 |
| 90 | 6430 | 6251 | 6072 | 589 | 57 | 5534 | 354 | 5175 | 4996 | 65.4816 | 61．5711 | 590 | 609 | 628 | 647 | 666 | 685 | 7046 | 7 | 7427 | 90 |
| 91 | 372 | 3543 | 33 | 3180 |  |  |  | 2455 | 2273 |  |  |  |  |  |  | 317 |  |  |  |  |  |
| 92 | 1017 | 0834 | 065 | －468 |  | 101 | $9{ }^{1}$ | 9734 | 95s | 6693 | 62939 | 9588 | 9783 | 97 | ， | O368 | 0563 | ， | 951 | 1 | 92 |
| 93 | 8311 | 81 | 794 | 775 | 7570 | 7385 | 7200 | 7014 | 6829 | 67－664 | 63.6234 | 643 | 662 | 68 | 7023 | 7220 | 7417 | 7614 | 78 |  | 93 |
| 94 | 5605 | ， | 5230 | 5043 | 485 |  | 析 | 4294 | 4106 | 68.3919 | $64 \cdot 3076$ | 3275 | 3474 | 367 | 迷 | 4072 | 427 | 447 | 466 | 488 | 94 |
| 95 | 28 | 2709 | 2520 | 2331 | 2142 | 1952 | 1763 | 574 | 384 | ．119 | 64.9917 | 118 | 0320 | 052 | 0723 | 0924 | 1125 | 1326 | 1527 | 172 | 95 |
| 96 | 0192 | ＋001 | 9810 | 961 | 9427 | 36 | 45 | 853 | 8662 | 47 | $65 \cdot 675$ | 696 | 7165 | 7369 | 7572 | 7776 | 7979 | 818 | 838 |  | 96 |
| 97 | 7486 | 7293 | 7100 | 6906 | 67 | 6520 | 6326 | 6133 | 5940 |  | 66359 | 380 | 4011 | 4216 | 4422 | 4628 | 4833 | 503 | 524 |  |  |
| 98 | 4779 | ， | 43 | 41 | 3999 | 3804 | 3608 | 3413 | 3217 | ， | 67 | 0648 | 08 | 1064 | 8121 | 1479 | 168 | 189 | 2102 |  | 98 |
|  | 2073 | 1876 | 1679 | 148 | 128 | 1087 | 990 | 0692 | 0495 | 72.029 | $67 \cdot 7282$ | 749 | 770 | 7912 | 8121 | 8331 | 8541 | 875 | 896 | 9170 | 99 |
| 100 | 9367 | 9168 | 8969 | 377 | 8570 | 8371 | 172 | 7972 | 7773 | 2＇757 | 68.4123 | 433 | 454 | 4759 | 4971 | 5183 | 5395 | 5607 | 5818 | 6030 | 100 |
|  | $50^{\prime}$ | $49^{\prime}$ | 48 | $47^{\prime}$ | $46^{\prime}$ | 45 | 44 | 1 $43{ }^{\prime}$ | ｜ $42^{\prime}$ | $4{ }^{1}$ |  |  |  |  | $146^{\prime}$ | $45^{\prime}$ | 4 | $143^{\prime}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| $43^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $0^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | 23 | $24^{4}$ | $2^{25^{\prime}}$ |  |  |  |  | 20 |  |  | 23 | ${ }^{24^{+}}$ | 25＇ | 26 | 27 |  |  |  |
|  | 274 | 7272 | 7270 | 7268 | 7266 | 7264 | 262 | 260 | 7258 | 7256 | 6862 | 6865 | 6867 | 6869 | 6871 | 8873 | 6875 | 6877 | 687 |  |  |
|  | 54 | 4543 | 4539 | 4535 | 4531 | 4527 | 4523 | 4519 | 4515 | 1．4511 | $1 \cdot 37$ | 3729 | 3733 | 3738 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 1791 | 1705 |  |  |  |  | 0594 |  |  |  |  |  |  |  |  |  |
|  |  | 90 |  |  |  |  |  |  | 9031 |  |  | 7458 |  |  |  |  |  |  |  |  |  |
| 5 | 5369 | 6359 | 6349 | 6339 | 6329 | 63 | 6309 | 6299 | 628 | 3.6279 | 3.4312 | 4323 | 4333 | 43 | 43 | 4365 | 4376 | 4386 | 4397 | 4407 |  |
|  | 3642 | ${ }^{3630}$ | 3618 | 3606 | 3594 | 13582 | 3570 | 3558 | 3546 | $4 \cdot 35$ | $4 \cdot 1174$ | 1187 |  | 121 | ${ }^{1225}$ |  |  |  |  |  |  |
|  |  |  |  | 087 |  | 08 | 0832 |  |  |  | $4 \cdot 80$ | 805 | 806 |  |  | 11 | 8126 | 40 | 155 | 8170 |  |
|  |  |  | 8158 | 8142 | 8126 | 738 |  |  |  |  |  | 4916 | 4933 | 4950 | 4967 | 4984 | 5001 | 5018 | 5035 | 50 |  |
|  | 5464 | 54 | 5428 |  | 5392 | 5374 |  |  | 5320 |  | $6 \cdot 1$ | 1781 | 1800 | 1819 | 1838 | 1857 | 1876 | 1895 | 1914 |  |  |
| 10 | 2737 | 2 |  |  |  | 203 | 2617 |  | 257 | $7 \cdot 2557$ | 6.8 | 18645 | 8666 | 8688 | 8709 | 8730 | 8751 | 8772 | 8793 |  |  |
| 11 | 1011 | 9989 | 9967 | 9945 | 9923 | 9901 | 9879 | 9857 | 19835 | 7.9813 | 7.5487 | 5510 | 5533 | 556 | 5580 | 5603 | 5626 | 5649 | 567 | 5696 |  |
| 12 |  | 72 | 7237 | 7213 | 7189 | 7165 |  |  | 7093 | $8 \cdot 706$ | 234 | 2374 | 2400 | 2425 | 2451 | 2476 | 2501 | 2527 | 2552 |  | 12 |
| 13 | 455 | 4533 | 4507 | 4481 | 4455 | 4429 | 4403 | 4377 | 4351 | 4325 | 8.9211 | 9239 | 926 | 929 | 9321 | 9349 | 9376 | 9404 | 9431 |  | 13 |
| 14 | 1932 | 1804 | 1776 | 1748 | 17 | 1692 | 1654 | 1636 | 1608 | 10 | 6074 | 6103 | 6133 | 616 | 61 |  | 6251 |  | 63 |  | 14 |
| 15 | 9106 | 90 | 946 | 901 | 89 | 8956 | 8926 | 8896 | 8866 | $10 \cdot 8$ | $10^{\circ}$ | 12968 | 300 | 303 | 3063 | 3095 | 3127 | 31 | 3190 | 3222 | 15 |
| 16 | 638 | 634 | 6316 | ${ }^{6284}$ | 6252 | 6220 | 618 | 615 | 61 | 11.60 | 10.97 | 9833 | ｜9866 | 99 | ｜ 9934 | 996 | －002 |  |  |  | $\frac{16}{16}$ |
| 17 | 365 | 3620 | 35 | 355 | 3518 | 3484 | 3450 | 341 | 33 | 12.33 | 11. | 6697 | 673 | 67 |  |  |  |  | 69 |  |  |
| 18 |  |  |  |  | 07 | 0747 | 11 |  |  |  | 12. | 3562 | 360 | 363 |  | 37 | 3752 | 379 | 382 |  | 18 |
| 19 | 527 | ${ }_{5}$ |  |  |  | 5275 |  |  |  |  |  |  |  |  |  | 05 | 0627 | 06 | 0707 | 0747 | 19 |
| 20 | 5475 |  |  | 55 |  | 5275 | 5235 |  | 515 |  |  |  | 7333 | 7375 |  |  |  |  |  |  |  |
| 21 |  |  |  |  |  | 25 |  |  |  | 2371 |  | 4155 |  |  |  |  | 4377 |  |  |  | 21 |
| $22$ | 72987 | 9978 | 9934 | 9890 | 9846 | 9802 | 9758 | 9714 | 9670 | 15.9626 15.689 |  |  | ， |  |  |  | 1252 | 1299 | ${ }^{134}$ | 1392 |  |
|  | 729 | 7250 | 7204 | 7158 | 12 | 7066 | 7020 | 6974 | 6928 | $16^{1681}$ | 15.78 | 7884 | 793 | 79 | 8030 | 80 | 8127 | 817 | 8224 | 8273 |  |
| 2 | 4570 | 4522 | 4474 | 26 | 4378 | 4330 | 4282 | 4234 | 4186 | 17.4138 | 16.46 | 1740 | 480 | 4850 | 4901 | 4952 |  |  |  |  | 24 |
| 25 | 18 | 17 | 174 | ， |  | 15 | 1544 |  | 144 | 18.1394 | $17 \cdot 1560$ | 1613 | 160 | 1719 | 1772 | 182 | 187 | 193 | 1983 |  | 25 |
| 26 | 9117 | 90 | 19013 | ${ }^{8961}$ | 18909 | ${ }^{8857}$ | 18805 | 18753 | 870 | 18.864 | $17 \cdot 8423$ | 8478 | 853 | 858 | 18643 | 8698 | ${ }^{8753}$ | 88 | 88 |  | 26 |
| 27 | 6391 |  | 83 | 6229 | 75 | 6121 | 6067 | 6013 | 595 | 19.5 | 18.52 | 5342 | 53 | 54 |  |  |  |  |  |  |  |
| 28 |  | 36 | 35 |  | 3441 | 3385 | 3329 | 3273 | 3217 | 20 | 19.21 | 2207 | 226 | 23 | 23 | 24 |  |  |  |  | 8 |
|  |  |  |  |  |  | 0649 | 591 | 0533 | 0475 | 21 |  |  | 913 |  |  | 93 |  |  |  |  | 29 |
| 30 | 8212 | 8152 | 8092 | 8032 | 7972 | 7912 | 7852 | 7792 | 7732 | 21.7672 | $20 \cdot 5872$ | 5936 | 5999 | 6063 | 6126 | 619 | 6253 |  | 6380 | 6443 |  |
| 31 | 5486 | 5424 | 5362 | 5300 | ${ }^{5238}$ | 5176 | 5114 | 5052 |  | 22 |  |  |  |  |  |  |  |  |  |  |  |
| 32 |  | 2696 | 2632 | 2568 | 2504 | 2440 | 23 | 23 | 2248 | $23^{2}$ |  |  |  |  | 98 |  | － 0 |  | 01 |  |  |
| 33 | － | 99 |  | 9836 |  | 97 | 96 | 9572 | 95 | 23 |  | 6530 |  |  | 67 |  | 78 | 6948 |  |  | 33 |
|  |  |  |  |  |  | 6967 | 6899 | 6831 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 35 | 458 | 451 | 4441 |  | 4301 | 4231 | 4161 | 4091 | 402 | 25 | 24 | 0259 |  |  | 0481 | 0555 | 10629 | 0702 | 10776 |  | 35 |
| 36 | 18 | 178 | 17 | 1639 | 1567 | 1495 | 14 | 13 | 127 | $26^{-1}$ | 24.7 | 7123 | 719 | 7275 | 735 | 7428 | 7504 | 758 | 765 |  | 36 |
| 37 |  | 90 |  | 8907 | 88 | 8759 | 86 | 8611 | 8537 | 26 |  |  | 40 | 41 | 42 |  |  | 4457 | 4535 |  |  |
| 38 | 645 | 63 | 62 | 6174 |  | 6022 | 5946 | 313 |  | $27 \cdot 57$ | $26^{\circ} 7$ | 0852 | 09 | 10 | 1093 | 17 | 4 | 1334 | 14 |  |  |
| 39 |  |  |  |  |  | 3286 | 3208 | 3130 | 3052 | 28.2974 | $26 \cdot 76$ |  | 77 | 78 | 79 | 80 |  |  |  | 83 |  |
| 40 | 09 | 0870 | 07 | 0710 | 0630 | 0550 | 0470 | 0390 | 0310 | 29.0230 | $27 \cdot 4497$ | 4581 | 466 | 475 | 483 | 492 | 5004 | 50 | 51 | 52 | 4 |
| 41 | 8223 | ${ }^{8141}$ | 805 | 7978 | 7896 | 7814 | ${ }^{7732}$ | 7650 | 7568 | 29.7486 | 28.13 | 1446 | 15 | 161 |  |  |  |  |  |  |  |
| 42 | 5497 | 5413 |  | 5245 | 5161 | 50 | 4 | 4 | 4825 | 30：474 | 28.82 |  | 83 | 84 |  |  |  |  |  |  | 仡 |
|  |  |  |  | 251 | 24 | 23 | 22 | 2169 | 2083 | 3119 |  | 5175 | 52 | 53 | 54 | 55 | 5629 | 57 | 5811 | 59 | 43 |
| 44 | 831 | 922 | 9869 |  |  |  | 9517 | 9429 | 934 |  |  |  |  |  |  | 24 |  |  |  |  | 44 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 45 |
| 46 |  | 45 |  | 16 | 4224 | 413 | 40 | 39 | 3856 | 33 | 31 | 5768 | 58 | 59 | 60 | 615 | 625 | 635 | 6449 | 654 | 46 |
| 47 | 1 | 17 | 16 | 1584 | 149 | 1396 | 1302 | 1208 | 1114 | 34．1 |  | 2633 | 273 | 283 | 293 |  | 1 | 322 | 332 |  | 47 |
| 48 |  | 90 | 18948 | 8852 | 8756 | 8660 590 | 8564 | 8468 57 | 8372 | 34．8 |  |  |  |  | 98 |  |  |  |  |  | 48 |
| 50 | ${ }^{64}$ | ${ }_{3}{ }_{35}^{63}$ | ${ }_{3487} 6217$ | 6120 | ${ }_{3287}^{6022}$ | 5924 | $\begin{gathered} 586 \\ 3087 \end{gathered}$ | 2987 | $2887$ | $36 \cdot 27$ | $\begin{aligned} & 33 \cdot 62 \\ & 34 \cdot 31 \end{aligned}$ | $\begin{aligned} & 6362 \\ & 3227 \end{aligned}$ |  | $\begin{aligned} & 6569 \\ & 3438 \end{aligned}$ |  | $\begin{aligned} & 6776 \\ & 3649 \end{aligned}$ |  |  |  |  | 49 |
| 51 | 0961 | 0859 | 0757 | 0655 | 0553 | 0451 | 0349 | ${ }^{0247}$ | 0145 | 37\％ | 34.99 | ＋091 |  | 030 | 04 | 05 |  |  |  |  |  |
| 52 |  |  |  |  |  | 77 | 7611 | 7507 | 7403 |  | $35^{\prime} 6$ | 595 | 706 | 71 | 72 |  |  |  |  |  |  |
| 53 |  | 5402 | 5296 | 5190 | 50 | 4979 | 4873 | 4767 | 4661 | 38．4555 | $36^{\prime} 3$ | 382 | 393 | 404 | 415 | 42 | 43 |  | 4604 | 47 | 53 |
| 54 |  | 2674 |  | 24 |  | 2242 | 2134 | 2026 | 1918 | 39.18 | 37 | 06 |  | 091 | 102 | 114 | 125 | 137 | 14 | 159 | 54 |
| 55 | ＋0．53 |  |  | 9726 |  | 9506 |  | 25 | 9176 |  | 37 | 7549 | 766 |  | 78 | 18014 |  | 8247 |  |  |  |
| 56 |  |  |  | 94 |  | 6770 | 6658 | 6546 | 643 | $40 \cdot 63$ | 38.4 |  |  |  | 476 |  |  |  |  |  |  |
|  |  | 4489 | 4375 | 426 | 4148 | 4034 | 3920 | 3806 | 369 | $41 \cdot 3$ |  |  |  | 15 | 164 |  | 18 |  | 2122 |  | 7 |
| 58 | 9150 |  |  |  |  | 1297 | 1181 | 10 | 0949 | 42.083 |  | 814 | 82 | 838 | 851 | 863 | 8756 | 887 |  | 912 | 58 |
| 59 |  |  |  |  |  |  |  |  | 820 |  |  |  |  |  | 53 |  |  |  |  |  | 59 |
|  |  |  |  |  |  |  |  |  |  |  |  | 1872 |  |  | 2253 |  |  |  |  |  |  |
|  |  |  | 07 |  | 04 | 03 | 0228 | ．104 | 9980 | 44.985 |  | 5601 | 5732 | 5863 | 599 |  | 625 |  |  |  | 62 |
| 63 | 82 | 81 | 52 |  | 77 | 76 | 7490 | 7364 | 7238 | 45.7112 | 43.23 | 2466 | 258 | 27 | 286 | 29 | 31 | 3 |  |  | 63 |
| 64 |  | 5391 | 52 |  |  | 48 | 4752 |  | 4496 | $46^{\prime} 4368$ | 43.91 |  | 946 | 960 | 973 | 987 | ${ }^{1}$ |  |  | 04 | 64 |
| 65 | 2793 | 2663 | 2533 | 2403 | 2274 | 2144 | 2014 | 1884 | 1754 | $47 \cdot 1623$ | $44 \cdot 605$ | 6195 | 63 | 64 | 660 | 67 | 6882 | 7019 | 71 | 7293 | 65 |
| －66 | P067 | 9935 | 19803 | 9671 | 9539 | 9407 | 9275 | 9143 | 9011 | 147.8879 | $45^{2} 29$ | 3052 | 319 | 333 | ${ }^{3478}$ | 36 |  |  | 4035 |  |  |
| 67 | 73 | 72 |  | 6939 | 68 | 6671 | 6537 | 64 | 6269 | 48.6135 | 45＇97 | 9924 | 106 | 020 | 0349 | 049 | 06 | 077 |  |  |  |
| 68 |  | 44 |  |  |  | 393 | 379 | 3663 | 3527 | $49 \cdot 33$ | $46^{\circ} 66$ | 6788 | 693 |  | 72 | 73 |  | 76 | 7794 |  | 析 |
| 69 | 916 |  |  |  |  | 84 | 832 |  | 0785 |  |  |  |  |  |  | 42 |  |  |  | 48 |  |
| 71 |  |  |  |  |  | 57 | 55 |  |  |  | 487 |  | 砫 | 763 | 783 |  |  | 82 |  |  |  |
|  |  | 35 |  | 3278 | 31 | 29 | 28 | 27 | 2558 |  |  |  |  |  |  |  |  |  |  |  |  |
| 73 | 8230 | － | 0691 | 0545 |  | 02 | 1 | 9962 | 981 | 52 |  | 1111 | 1265 | 14 | 15 | 1728 | 18 | 203 | 2191 |  | 73 |
|  | 825 | ， |  |  |  |  | 73 | 7221 | 703 |  | 50 | 矿 | 8132 | 82 | 84 | 8601 | 8 | 891 |  |  | 74 |
| 75 | 553 | 538 | 231 | 508 | 4 | 4781 | 4631 | 4481 | 4331 | 54．4181 | 51．4681 | 4840 | 49 | 515 | 531 | 5474 | 563 | 57 | 594 | 61 | 75 |
| 76 | 2804 | 2652 | 2500 | 234 | 219 | 2045 | 1893 | 1741 | 1589 | 55．14 | $5{ }^{5}$ | 1704 |  | 20 | 218 | 23 | 2 | 2 |  |  | 76 |
| 77 | 107 | ， | 977 |  | 9463 | 9309 | 9155 | 9001 | 8847 | 5 | 52 | 8569 | 8732 | 889 | 90 | 92 | 93 | 934 | 97 |  |  |
| 78 | 73 | 719 | 704 | 68 |  | 65 | 6416 | 6260 | 6104 | 56．59 | 53：52 | 5433 | 5598 | 57 | 59 | r09 | 62 | 64 | 65 |  | 78 |
| 79 |  |  | 435 | 4152 |  | 383 | 367 | 3520 | 3362 | 57．32 |  | 2298 | 246 | 26 | 27 |  |  |  |  |  | \％ |
| 80 |  |  | 157 |  |  |  |  |  |  |  | 5 | 9163 | 9332 | 9501 | 9670 |  |  | 0177 |  |  |  |
| 81 | 917 | 2 | － | 5 | 55 | ${ }^{836}$ | ${ }^{82}$ | 80 | ${ }^{7878}$ | ${ }^{55} 77$ | 55．58 | ${ }^{6027}$ | ${ }^{6198}$ | 63 | 654 | 67 | ${ }^{68}$ | 70 |  |  |  |
| 82 | 644 | 6283 | 61 | 595 | 57 | 562 | 5463 | 529 | 5135 | 59.497 | 56．27 | 2892 | 3065 | 32 | 341 | 35 | 37 | 39 |  | 42 | 82 |
| 83 | 372 | 3554 |  | 32 | 30 |  | 27 | 255 | 239 |  |  | 9 | 9 | －10 | 2 | 0458 | － |  |  | 115 |  |
| 84 | 09 | 032 | ${ }_{79} 06$ | ${ }_{7758}$ | ${ }_{75}$ | ${ }_{7419}$ | 7240 | 78 |  |  |  |  | 6798 |  | 7154 |  | 7508 | 76 | 7863 | 804 | 84 |
| 86 | 554 | 53 | 51 | 502 | 4854 | 4682 | 4510 | ${ }^{4338}$ |  | 62 |  |  | 0532 | 0713 | 089 |  |  |  |  |  | 35 |
|  | 281 | 26 | 24 | 22 | 21 | 1946 | 1772 | 1598 | 142 |  |  | 7214 | 7398 | 7582 | 76 | 咗 | d | dat | 85 |  |  |
| 88 | 808 | 991 |  |  |  | 9210 | 9034 | 8858 | ${ }_{8}^{8682}$ | 63 575 | 60．3893 | 403 | 4265 | 4451 | 4637 | 482 |  |  |  |  |  |
|  | 7 |  |  |  |  | ${ }^{6473}$ |  |  |  | 64.5761 | 61.0755 | 0943 | 1132 | 1320 | 1508 |  | 188 |  |  |  |  |
| 90 | 4636 | 4457 | 4277 | 4097 | 3917 | 373 | 3557 | 3377 | 3197 | 65.3017 | 617617 | 7808 | 7998 | 8188 | 8379 | 8569 | 875 | 8949 | 913 | 93 | 90 |
| 91 | 191 | 17 | ${ }^{1547}$ | 1365 | 93 |  | O8 | ${ }^{0637}$ | ${ }^{0455}$ | $66^{\circ} 273$ | 62．442 | 14672 | ${ }^{4865}$ | 5057 | 525 | 544 | 563 | 58 |  |  |  |
| 92 | 918 | 900 | 8816 | 8633 | 8849 | 8265 | 8081 |  | 773 | ${ }^{66 \cdot 7529}$ | 63．1342 | 1537 | 1732 | 1926 | 212 | 2315 | 250 | 27 | 289 |  |  |
| 93 | 6457 | 627 |  | 5900 | 5714 | 5529 | 5343 | 5157 | 4970 | 67.4784 | 63：8205 | 8401 | 8598 | 8795 | 899 | 9188 | 938 |  |  |  |  |
| 94 |  | 35 |  | 0436 |  | ${ }^{2792}$ | ${ }_{9866}^{2604}$ | 2416 | ${ }_{9488}^{2228}$ | ${ }^{68} 204$ | 64：5067 | 仡 | 5465 | 56 | 5862 | 6061 |  | 6438 |  |  |  |
| 95 | 1005 |  |  |  |  |  |  |  | 9486 | 68．929 | $65 \cdot 1930$ | 2131 | 2331 | 25 | 2733 | 293 | 3135 | 33 | 35 |  |  |
| 96 | 827 | 808 | 789 | 77 | 7512 | 7320 | 7128 | 6936 | 6744 | 69.655 | $65 \cdot 87$ | 8995 | 9198 | 940 | 960 |  |  |  |  | 061 |  |
|  | 5552 | 535 | 516 | 49 | 4777 | 4584 | 4390 | 4196 | 2001 | 70．3807 | 66．56 | 5860 | 6065 | 627 | 64 |  |  |  |  |  |  |
| 98 | 282 | 26 |  |  | 2043 |  |  |  |  | 711063 | 67.251 | 2724 | 2931 | 3139 | 33 | 3553 | 3760 | 3967 | 4174 |  |  |
| 100 | 7374 | 7974 | 6974 | 6775 | 6575 | 6375 | 6175 | 5975 | 8517 | $72 \cdot 5575$ | $68 \cdot 6242$ | 6453 | 6665 | 6876 | 7088 | 7299 | 7510 | 7721 | 7933 |  |  |
|  | $40^{\prime}$ | $39^{\prime}$ | $38^{\prime}$ | $37^{\prime}$ | $36^{\prime}$ | $35^{\prime}$ | $34^{\prime}$ | $33^{\prime}$ | $32^{\prime}$ | $31^{\prime}$ |  |  | 38＇ | $37^{\prime}$ | 36 | $35^{\prime}$ | $34^{\prime}$ | $33^{\prime}$ |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| Cosinge． |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $43^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 32＇ | $3{ }^{\prime}$ | $34^{\prime}$ | ${ }^{3}{ }^{\prime}$ |  |  | 88 |  |  |  |  |  | $34^{\prime}$ | 35 |  |  |  |  |  |
|  | 7254 | 7252 | 7250 | 7248 | 7246 | 7244 | 24 | 724 | 7238 | 723 | 6884 | 6886 | 6888 | 6890 | 6892 | 6894 | 6896 | 6898 | 6900 | 6903 |  |
|  |  | 45 | 4499 | 4495 | 4491 | 4487 | 4483 |  | 44 | 1.447 | 1 3767 |  |  |  |  |  |  |  |  |  |  |
|  | 1761 | 1755 | 17 | 1743 | 173 |  |  |  |  | $2 \cdot 1$ |  |  |  |  |  |  |  |  |  |  |  |
|  | 9015 |  |  |  | 89 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 6269 | 6259 | 6249 | 6239 | 6229 |  |  |  |  |  |  |  |  |  |  | 447 | 4481 |  | 4502 | 451 |  |
|  | 3522 |  |  |  | 34 |  |  |  |  | 43 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 07 |  |  |  |  |  |  |  | 8214 |  |  | 825 | 73 | 8 |  |  |  |
|  | 8030 |  |  | 7982 |  |  |  |  |  | 5.78 | 5.50 | 5085 | 5102 | 511 | 5136 |  | 70 | 6 | 5203 |  |  |
|  | 528 |  | 5248 |  | 5212 |  |  |  | 5139 | 6.512 | 6．1952 | 1971 |  |  | 2028 | 2047 | 2066 |  |  |  |  |
| 10 | 2537 |  |  |  |  |  | 2417 |  | 硣 | \％ | 6．8835 | 8857 | 887 | 889 | 892 | 号 | 896 | 89 |  |  |  |
| 11 | 9791 | 9769 | 9747 | 9725 | 9703 | 9681 | 9659 |  | 9615 | 7.959 | $7 \cdot 57$ | 574 |  |  |  | 58 | 58 | 5881 |  |  |  |
| 12 | 7045 |  |  | 6973 | 69 | 69 |  |  |  | 8.68 |  | 26 |  |  |  |  | 2754 |  |  |  |  |
| 13 | 429 | 42 | 42 | 4221 | 41 | 4168 | 41 | 411 |  | 9.40 | 8.9486 | 9514 |  |  |  |  | 9651 | 96 |  |  |  |
|  | 15 | 15 | 149 | 1468 | 14 | 1412 |  |  | 1328 |  |  |  |  |  |  |  | 6547 | 6576 | 660 |  |  |
| 1 | 8806 | 8776 |  |  |  |  |  |  |  | 10. | 10 |  |  |  |  |  |  | 3475 | 3506 |  |  |
| 16 | 6060 |  |  |  |  |  |  |  |  | 11.57 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 | 0567 | 053 |  | 0459 | 0423 |  |  | 0315 | 027 | 13．72711 |  |  |  | 401 |  |  | 4132 | 4169 | 4207 |  |  |
| 19 | 7821 |  |  |  |  |  |  |  | 75 | 13.7 | 13.0 |  |  |  |  |  | 1028 | 1068 |  |  |  |
| 20 | 5075 | 50 | 4995 | 4955 | 4915 | 4874 | 4834 | 4794 | 47 | 14.471 | 13.76 |  | 775 | 779 | 784 | 788 | 792 | 78 | 800 |  |  |
| 21 | 232 | 2287 | 224 | 2202 | 2160 | 2118 | 2076 |  | 1992 | 15.195 | 14 | 459 |  |  |  |  |  |  |  |  |  |
| 22 | 95 | 95 | 94 |  |  |  |  |  | 9230 |  |  |  |  |  |  |  |  |  |  |  |  |
| 23 | 68 | 67 |  |  | 6652 |  |  |  | 6467 | 16 |  |  | 841 |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 3897 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 26 | 8597 | 8545 | 84 |  |  |  |  |  |  | 18.81 |  |  |  |  |  |  |  | 93 | 9411 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | 311 |  | 29 | 2937 | 28 | 2824 |  |  | 2656 | 2 | 18. |  |  |  |  |  |  | 3152 |  |  |  |
| 29 | 0359 |  |  |  | 01 |  |  |  | 983 | 20．983 | 19.9 |  |  |  |  |  |  | $\bigcirc$ | 01 |  |  |
| 30 | 761 | 7552 | 7492 | ， | 7372 | 731 | 725 | 719 | 7131 | 21.70 | 20. | 657 | 663 | 669 | 67 | 68 | 68 |  | 70 |  |  |
|  | 486 | 4804 |  |  |  | 4555 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 | 12 |  |  |  |  |  |  |  |  | 23 | $22^{\circ} \mathrm{O}$ |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 917 | 9109 |  |  |  | 88 | 23 |  |  |  |  |  |  | 75 | 76 | 77 |  |  |
|  |  |  |  |  | 63 |  |  |  |  |  |  |  |  | 425 |  |  |  |  |  |  |  |
| 35 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 12 | 1367 | 1441 | 151 |  |  |
| 36 | 113 |  |  | 0918 | 0846 | 0774 | 0702 | ${ }^{063}$ | 0557 | 26.048 | 24 | 788 | 7960 | 803 | 81 | 818 | 826 | 83 |  |  |  |
|  | drs |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 |  | 5566 |  |  | 53 | 25 |  |  |  | 27.49 | 26. | 1655 |  |  |  |  |  |  |  |  |  |
| 39 |  | 28 |  |  | 258 |  |  |  |  | 28.2 |  |  | 862 |  |  |  |  |  |  |  |  |
| 40 | 15 | P07 | 99 | 99 | 9829 | 97 | 9669 | 9588 | 9508 |  |  | 5426 | 551 |  |  |  |  | 5932 |  |  |  |
| 41 | 7404 | ${ }^{73}$ | 723 |  | 7075 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 46 | 45 | 44 | 44 | 432 | 42 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 44 |  |  |  |  | 8812 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6.5 | 6418 | 6328 | 623 | 6148 | 6058 | 5968 | 5877 | 578 | 5697 | $32 \cdot 5606$ | 30.97 | 9854 |  | －04 |  | 02 |  |  |  |  |  |
| 46 | 367 | 35 | 348 |  | 3304 | 3211 | 3119 |  | 293 | 33 | 31. |  | 683 |  |  |  |  |  |  |  |  |
| 47 |  |  |  |  |  | 04 |  |  |  | 34．0． | ， |  |  |  |  |  | 4121 |  |  |  |  |
| 40 | 818 | 8 |  |  |  |  |  |  | 741 | 34．73 | $33^{\circ}$ |  |  |  |  |  | 10 | 1118 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 79 | 80 | 81 |  |  |
| 50 | 2687 | 25 |  | 238 | 22 | 2186 | 2086 | 1986 | 1885 | $36 \cdot 17$ | 34.417 | 4283 | 4388 | 4494 | 459 | 470 |  | 4915 | 5020 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 67 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 | 448 | ${ }^{43}$ |  |  | 40 | 3917 | 38 |  |  |  |  | 494 | 5 |  |  |  |  |  |  |  |  |
| 54 |  | S8 |  |  |  | 11 |  |  | 907 | 39.0728 | 3310 | 971 |  |  |  | 281 |  |  |  |  |  |
| 55 | 8956 | 88 | 87 |  | 8515 |  | 8295 |  | 807 | $39 \cdot 796$ | 37•859 | 8711 | 882 | 894 | 905 | 917 | 929 | 94 | 95 |  |  |
|  | 6210 | 6097 |  |  |  | 5649 | 5536 | 542 |  | $40^{\circ} 5$ |  |  |  |  |  |  |  |  |  |  |  |
|  | 3463 | 33 |  |  | 30 | 289 |  |  |  | 41 |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  | 01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 59 | 797 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 | 52 |  |  |  | 4744 | 4623 | 4503 | 4383 | 4262 | $43^{\prime} 41$ |  |  | 3266 |  | 3519 | 364 | 3772 |  | 4024 |  |  |
| 61 |  |  |  |  |  |  |  |  |  | $44^{1} 13$ |  |  | 01 |  |  |  |  |  | 092 |  |  |
|  | 9732 |  |  |  |  |  |  |  | 873 |  |  |  | 7041 |  |  |  |  |  |  |  |  |
| 6 | － | 1 | 67 |  | 64 | 63 | 砣 |  | 5213 | 45.58 | 43＇36 |  | 3817 |  | 419 | ${ }^{43}$ | 136 |  |  |  |  |
| 6 | 4240 | 41 | 39 | 3855 | 37 | 35 | 347 | 334 | 3213 | $46 \cdot 30$ | 44．05 | 06 | 081 |  | 108 | 12 | 13 |  |  |  |  |
| 65 | 1493 | 136 | 1233 | 1103 | 10972 | 08 | 0712 | 058 | 045 | $47^{\circ} 03$ | $44 \cdot 74$ | 75 | 770 | 784 | 797 | 81 | 82 | 839 | 85 |  |  |
| 66 | 8747 | 8615 |  |  |  |  |  |  | 76 |  | 45.43 |  | 459 |  | 1481 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 176 | 19 |  |  |  |  |  |
| 68 | 3255 | 3118 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 6128 |  |  |
| 70 | 7762 |  |  |  | 72 | 706 | ， 2 |  | 63 | 50.64 | － | 咗 | 仡 | 2291 | 2 | 258 | 273 |  | 3028 |  |  |
|  |  |  |  |  |  | 43 | 4162 | 0 |  |  |  |  |  |  | 93 |  |  |  |  |  |  |
|  | 2270 | 2125 | ， |  |  |  |  |  |  |  |  |  |  |  | 622 |  | 652 |  |  |  |  |
| 73 | 957 | 938 | 9231 | 9085 | 89 |  | 8645 | 8499 | －530 | 52 | 50 | 26 |  |  | 3115 |  | 34 |  |  |  |  |
|  | 677 | 662 |  | 633 | 618 |  |  |  | 559 | 53.54 | 50 | 95 |  |  |  | 01 | 03 | 047 |  |  |  |
| 75 | 403 | 388 |  |  | 34 |  |  |  |  |  |  |  |  |  |  |  |  | 7373 |  |  |  |
| 76 | 128 | 1132 |  |  |  |  |  | ${ }^{0}$ | ${ }^{0} 06$ |  |  |  |  | \％ | O61 |  |  |  |  |  |  |
|  |  | 8384 |  |  |  |  |  |  | 730 |  |  |  |  | 052 | 068 | 08 |  |  |  |  |  |
| 78 | 518 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 暏 |  |  |  |  |  |  |  |  |  |  |  |  | 413 |  | 185 | 463 |  |  |  |  |  |
| 80 | 0300 | ＋139 | 9978 | 教 | 迷 | 硣 | 仡 | 婩 | 906 | 57：885 | 5506 | 885 |  | 19 | 135 | 152 | 189 | 18 | 203 | 22 |  |
|  | 755 | 7391 |  |  | 6904 | 6742 | 6579 | 64 | 625 |  |  | 7738 |  |  |  | 84 |  |  |  |  |  |
| 82 | 480 | 4643 | 478 | 4314 | 415 | 39 | 3821 |  | 349 | 59•33 | 56．44 | 46 | 47 |  | 5142 |  | 54 |  |  |  |  |
| 8 | 2061 | 189 | 17 | 1562 | 13 | 12 | 1063 |  | 073 | 60.05 | 57 |  |  |  | 203 |  | 23 |  |  |  |  |
|  |  | 9146 |  |  | 86 | 84 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 | 6568 | 6398 |  |  | 588 | 5717 |  | 53 | 20 | $61 \cdot 50$ |  |  |  |  | 5818 |  |  |  |  |  |  |
| 86 | 382 | 36 |  |  |  |  | 27 | 2615 |  |  | 59 |  |  | 252 |  |  |  |  |  |  |  |
| 87 |  |  |  |  |  | 0204 | ＋0 |  |  |  |  |  |  |  | 9602 |  |  |  |  |  |  |
| 88 | 83 | 8153 |  |  | 7624 |  | 72 |  | 6918 |  | 60 | 593 | 612 | 6309 | 6494 |  |  |  |  |  |  |
| 90 | 5583 | 2657 | 2476 | 2296 | 2116 | 14691 | 4513 <br> 1755 | ${ }_{1574}^{4334}$ | ${ }_{1393}^{4156}$ | ${ }_{65 \% 1213}^{64377}$ | 61． 2636 61.9519 | 770 | 989 | －089 | 0278 | 046 | 065 | 084 | 103 |  |  |
|  | \％ |  |  | 9544 | 936 |  | 8996 | 8814 | 8631 |  | 62＇640 |  |  | 6978 |  | 736 | 755 |  |  |  |  |
| 92 | 736 | 716 | 6976 | 6792 | 660 | 642 | 62 | 6054 | 5869 | $66 \cdot 568$ | 63．328 | 34 |  |  | 4062 | 425 | 44.5 | 46 |  |  |  |
| 93 | 459 | 441 | 4226 | 4039 | 385 |  |  | 32 | 3107 | 67．29 | 64．017 | 036 | 05 |  | 095 | 115 | 13 |  |  |  |  |
| 94 |  |  | 1475 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 84 |  |  |  |
| 95 | 91 | 8915 |  | 8535 | 834 | 8154 |  | 7773 |  |  |  |  | 433 | 4538 | 47 | 4938 | 5139 | 533 |  |  |  |
| 96 | 635 | 616 |  | 5782 | 559 | 539 |  | 5012 | 482 |  |  | 102 | 122 | 142 | 163 | 183 | 203 | 23 |  |  |  |
| 97 |  | 3419 |  |  |  |  |  |  |  |  |  |  |  |  |  | 872 |  |  |  |  |  |
| 98 | 0867 |  |  |  |  |  |  |  |  |  |  | 479 | 50 |  | 5414 | 5621 |  |  |  |  |  |
|  | 8121 5374 | 5174 | 4974 | 4773 | 4573 | 4372 | 4172 | 3971 | 3771 | 72－3570 | 68．1471 | （1680 | 1889 8777 | 8987 | 9198 | 9409 | 9620 | 9830 | ． 041 | 025 |  |
|  | 374 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | $30^{\prime}$ | $29^{\prime}$ | 28 | 27 | 26 | $25^{\prime}$ | $24^{\prime}$ | $23^{\prime}$ | 22 | $21^{\prime}$ | $30^{\prime}$ | 29 |  |  | 26 | 25 | 24 |  |  | 21 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 4534 | ${ }_{454}$ |  |  |  |  |  |  |  |  |
|  | 3402 | 3390 | \|337 | ${ }^{336}$ | 3354 | ${ }^{3342}$ | 3330 | ${ }^{3318}$ | 336 | 432 | 4.12 | ${ }^{1440}$ | 1453 | 1466 | 1478 | 1491 | 1503 | 1516 |  |  |  |
|  |  | ${ }_{7853}^{0622}$ |  |  |  |  | 0551 |  |  |  |  | ${ }^{33254}$ |  |  | ${ }_{5331}^{8304}$ | ${ }_{5321}^{8806}$ |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  | 4977 | ${ }^{4158}$ |  |  | 2100 |  |  |  | 2236 |  |  |  |  |  |
|  | 2571 | 9548 | 9526 |  | 9482 | 9460 |  | 9416 | 9394 | 7 | 7.5951 | 5974 |  | 60 | ${ }^{6043}$ | ${ }^{6066}$ | 990 | 6113 |  |  |  |
|  |  |  | 6756 |  |  |  |  |  |  |  |  | 2881 | 2906 |  |  | 2982 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 8445 | 8615 |  |  |  |  |  |  |  | 3601 | 3632 | 366 |  | 3727 | 3758 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 0206 |  |  |  |  |  |  |  | ${ }_{9}^{26917}$ |  |  |  |  |  |  | ${ }_{4}^{7572}$ |  |  |  |  |  |
|  | ${ }^{74490}$ |  |  |  |  |  |  |  | ${ }_{4} 7138$ | 14 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{63}$ |  |  |  |  |  |  |  |  |  |  |  |  |  | 5963 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $26$ |  | 802 |  |  |  |  |  |  |  |  |  |  |  |  |  | 793 |  |  |  |  |  |
| ${ }_{28}^{27}$ | 5543 | ${ }_{24} 5$ |  |  |  |  |  | $\begin{gathered} 2939 \\ 2999 \end{gathered}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 701 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 313 | 424 | 418 | ${ }_{13120}^{4120}$ | ${ }^{40575}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{gathered} 38 \\ 39 \\ 39 \end{gathered}$ | 488 | 480 | 4727 | 463 | 4575 | ${ }_{4498}$ |  |  | 42 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{2}$ |  |  | , |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 410 \end{aligned}$ |  | 649 |  |  |  | 6169 |  | ${ }^{600}$ |  |  |  |  | ${ }^{3262}$ | 3348 |  |  |  |  |  |  |  |
| 4.4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $46$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 |  |  |  |  | 988 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 49 |  |  | 425 | 4155 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{0653}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 |  |  | 4862 | ${ }^{47497}$ | 463 | ${ }^{4524}$ | ${ }_{4}^{4611}$ | ${ }^{4298}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 9554 |  |  |  | 988 |  |  | 8738 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 390 |  | ${ }^{5633}$ | ${ }_{3539}^{63 / 3}$ |  |  |  |  |  |  | 440 |  | 7745 |  | 4908 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 64 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 66 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 1891 |  |  | 1481 | 1344 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }_{70}^{69}$ |  |  |  | 59 |  |  |  |  |  |  |  | ${ }^{6564}$ |  |  |  | 4059 |  |  |  |  |  |
| $\begin{aligned} & 71 \\ & 721 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 74 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1720 |  |  |  |  |  |
|  |  | 23 |  |  |  |  |  | 147 | 132 | 54. |  |  |  |  |  | 863 |  |  |  |  |  |
|  |  |  |  | 9322 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 83 \\ & 884 \\ & 84 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 91 | 89 | 88 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 085 | ${ }^{3657}$ | (328 |  |  | 194 | 2765 |  |  |  | 1605 | 794 |  |  |  | 255 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 977 | 95 | 940 |  | 902 | 883 | 864 |  |  |  | 923 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | 58.548 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 89 |  | 55 | 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 析 |  | ${ }_{1782}^{4742}$ | ${ }_{1}^{454}$ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | $16^{\prime}$ | $1{ }^{15^{\circ}}$ |  |  |  | $11^{\prime}$ |  |  |  |  | \|16 ${ }^{1}$ | [15 ${ }^{5}$ |  |  |  | 1 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES．

| 43 | Cosine． |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $43^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $50^{\prime}$ | 51 | $52^{i}$ | $53^{\prime}$ | $54^{\prime}$ | E5 $5^{\prime}$ | 56 | 57 | $58^{\prime}$ | 59 | $50^{\prime}$ | $51^{\prime}$ | $52^{\prime}$ | 53 | $54^{\prime}$ | $55^{1}$ | $56^{\prime}$ | $57^{7}$ | $58^{\prime}$ |  |  |
|  | 7214 | 72 | 72 | 72 | 7 | 720 | 72 |  |  | 7195 | 92 | 6928 | 6930 | 6932 | 6934 | 6936 |  |  |  |  |  |
|  | 442 | 442 | 441 | 4415 | 441 | 443 | 44 | 43 | 43 | 1.439 | ． 3851 | 3855 | 3860 | 38 |  | 3872 | 3876 |  |  |  |  |
|  | 1641 | 1635 | 1629 | 1623 | 1617 | 1610 | 160 | 1598 | 159 | $2 \cdot 158$ | ． 077 | 0783 | 07 | 079 | 0802 | 08 | 0815 | 0821 | 0827 | 0833 |  |
|  | 885 |  | 88 |  | 8822 | 8814 | 88 |  | 8 |  |  | 771 | 77 | 7728 | 7736 | 774 | 775 | 776 |  | 778 |  |
| 5 | 606 | 6058 |  |  |  |  |  |  | 598 | 59 |  | 463 |  | 4660 | 467 | 468 | 4691 | 470 | 4712 | 4722 |  |
| 6 | 3281 | 32 | 3257 | 3245 | 3233 | 3221 | 3209 |  | 3185 | 4.3173 |  | 1566 | 1579 | 1592 | 1604 | 1617 | 1629 | 1642 | 1654 |  |  |
|  | 0495 | 0 | 046 | 045 | 0439 | 04 | 0410 | 0396 | 03 | 5.03 |  | 849 | 8509 | 8523 |  | 85 | 8567 | 8582 |  | 861 |  |
|  | 7709 |  |  |  |  |  |  |  | 75 | 5.756 | 5.54 | 54 | 5439 | 54 | 5472 | 54 | 55 | 55 | 5539 | 555 |  |
|  | 492 | 4904 | 4886 |  | 4850 | 4831 |  | 4795 | 4777 |  |  | 2350 | 2368 | 2387 | 2406 | 242 | 288 | 24 | 2482 | 2500 |  |
| 10 | 2736 | 2116 | 209 | 2075 | 2055 | 2035 | 2015 | 1995 | 1974 | 7.195 | 6．925 | 92 | 9298 | 9319 | 9340 | 9361 | 9382 | 440 | 9424 | 44 |  |
| 11 | 93 | 93 |  |  |  |  |  |  |  |  | 7.6182 | 6205 | 62 | 625 | 6274 | 6297 | 6320 | 6343 | 6366 |  | $\frac{11}{11}$ |
| 12 | 656 | ， | 6515 |  |  |  |  |  | 636 | 8.634 |  | 3133 | 31 | － 3183 | 208 | 323 | 3259 |  | 3309 |  |  |
| 13 | 3776 | 3750 | 3724 |  | 367 | 364 | 36 | 35 | 356 | 9．3540 | 9－0033 | 006 | 00 | 01 | 0142 | 01 | 019 | 0224 | 0251 | 0278 | 13 |
| 14 | 099 | 0962 | 09 |  | 0877 |  | 0821 | 0792 | 076 | 10.073 | 9.6959 | 69 |  |  | 707 | 710 | 71 | 7164 | 7194 | 72 |  |
| 15 | 820 | 8173 | 43 | 8113 | 8083 | 8052 | 22 | 7992 |  | 10.7 |  |  |  | 3979 | 4010 | 404 |  | 410 | 4136 | 2167 | 15 |
| 16 | 541 | 53 | 53 | 5320 | 5288 | 5256 | 5224 | 5191 | 5159 | 11 | 11.0810 | 0844 | 0877 | 0911 | 0944 | 0978 | 101 | 1045 | 1078 | 112 | 16 |
| 17 | 26 | 2597 | 2562 | 252 | 2493 |  | 2425 | 2391 | 2356 | 12 | 117 | 77 | 78 |  | 7878 | 79 | 795 | 7985 | 8021 | 805 | 7 |
| 18 | 984 | 980 | 9772 | 9736 |  |  |  | 95 | 95 | 12.9 | 12 | 46 | 4737 | 4775 | 4812 | 48 | 48 | 4925 | 4963 |  |  |
| 19 | 705 | 70 | 6981 | 6943 | 69 |  |  | 6790 | 675 | 13. | 13.15 | 1627 | 1667 | 1707 | 1746 | 1786 | 1826 | 1866 | 1906 | 194 |  |
| 20 | 427 | 4231 | 4191 | 415 | 4110 | 4070 | 4030 | 3989 | 3949 | 14.3908 | 13.85 | 85 | 85 | 86 | 8680 | 872 | 87 | 8806 | 8848 | 8890 | 20 |
| 21 | 14 |  |  |  |  |  |  |  |  |  | 14 |  |  |  |  |  |  |  |  |  |  |
| 22 | 869 | 8654 | 8610 | 85 | 85 |  | 8432 |  | 8344 | 15. | 15.23 | 2410 |  |  |  | 2595 |  |  |  |  |  |
| 23 | 59 | 5866 | 5820 | 57 | 57 | 5680 | 5634 | 5588 | 55 | $16 \cdot 5$ | 15.92 | 93 | 93 | 9434 | 94 | 95 | 957 | 96 | 9675 | 972 | 23 |
| 24 | 312 | 3077 | 3029 | 2981 |  |  |  | 2787 | 27 | $17 \cdot 26$ | 16.621 | 6265 | 63 | 6366 | 64 | 64 | 65 |  | 618 |  |  |
| 25 | 033 | 028 | 0239 | 188 | 01 | 0087 | 87 | 86 | 9936 | 17.9 |  | 319 | 3246 | 3298 | 3350 | 34 | 345 |  | 560 |  |  |
| 26 | 75 | 7501 | 7448 | 7396 | 7343 | 7291 | 7238 | 7186 | 7133 | 18 | $18^{\circ} 0066$ | 0121 | 0175 | 0230 | 0284 | 0339 | 039 | 0448 | 0502 |  | 26 |
| 27 | 47 | 4712 | 4658 | 4603 |  |  |  | 4385 | 433 | 19.42 | 18.69 | 704 |  |  | 7218 | 7275 | 733 |  |  |  |  |
| 28 | 198 |  | 8077 | 1811 |  |  |  | 1585 | 1528 | 20.147 |  |  |  |  | 4153 | 4211 |  |  |  | 444 |  |
| 29 | 919 | 9135 | 90 | 9018 | 896 |  |  | 8784 | 8726 |  | 20.08 | 0904 | 0965 |  | 1087 | 114 | 120 | 126 | 1330 | 39 |  |
| 30 | 6407 | 6347 | 6286 | 6226 | 6165 | 6105 | 6044 | 84 | 5923 | 21.586 | 20.776 | 783 | 78 | 7958 | 802 | 808 | 814 | 82 | 827 | 8335 | 30 |
| 31 | 36 |  |  |  |  |  |  |  |  | 22.3 |  |  | 4825 |  | 4955 |  |  |  |  |  |  |
| 32 | 083 | 078 |  |  | 057 |  |  |  | 031 | 23 | $22 \cdot 16$ |  | 1754 | 18 | 1 |  |  |  |  |  |  |
| 33 | 80 | 7981 | 7915 | 7848 | 7782 | 771 | 7649 | 7582 | 7515 | $23 \cdot 74$ | 22 |  | 8684 | 87 | 88 | 8892 | 896 |  | 9099 | 2168 |  |
| 34 | 526 | 5193 | 5124 | 5056 |  |  | 4850 | 4782 | 4713 | 24. | 23 |  |  | 5685 | 5757 | 58 | 589 |  | 042 |  |  |
| 35 | 2475 | 2405 | 2334 | 2263 | 219 |  | 2052 | 1981 | 191 |  | 4 | 247 | 2544 | 2617 | 269 | 27 | 283 | 291 |  |  |  |
| 36 | 96 | 9616 | 9544 | 9471 | 9398 | 9326 | 9253 | 9180 | 9108 | 25.903 | 4.93 | 9398 | 9474 | 9549 | 962 | 9700 | 977 | 9851 | 9926 |  |  |
| 37 | 690 | 6828 | 6753 | 6679 |  |  |  |  |  | $26 \cdot 62$ | 25 |  |  |  |  | 6636 | 67 |  |  |  |  |
| 38 | 411 |  | 1 | 3886 |  |  |  | 3579 |  | 27 | 26 |  |  |  |  |  | 365 |  |  |  |  |
| 39 | 132 | 1251 | 11 | 1094 | 101 |  |  | 0779 |  |  | 27 |  |  | 034 | 042 | 050 | 059 | 067 | 0754 | 83 |  |
| 40 | 8543 | 8462 | 8382 | 8301 | 8220 | 8140 | 8059 | 7978 | 7898 | 28 | $27 \cdot 702$ | 71 | 7193 | 72 | 7361 | 74 | 7528 | 76 | 7696 | 778 | \％ |
| 41 | 5757 | 5674 | 5591 |  |  |  |  |  |  |  | 28.39 |  |  |  |  |  |  |  |  |  |  |
| 42 | 297 |  | 2801 | 271 |  |  |  | 2377 | 22 | $30 \cdot 22$ |  |  |  |  |  |  |  |  |  |  |  |
| 43 | 018 | 0097 | ¢010 | 9924 | 983 |  |  | 9577 | 949 | $30 \cdot 94$ |  |  |  | 8073 | 8163 |  | 8343 | 8433 |  |  |  |
| 43 | 7397 | 7309 | 7220 | 7131 | 704 |  | 6865 | 暏 | 6687 | 31.65 | 30.472 | 4820 | 4912 | 500 |  |  | 281 | 5373 | 5466 |  |  |
| 45 | 461 | 452 | 4429 |  |  | 41 |  |  |  |  | 31.165 |  |  | 193 |  |  | 221 |  |  |  |  |
| 46 | 182 | 1732 | 1639 |  |  |  |  |  |  |  | 31.857 |  |  |  |  |  | 915 | 9254 |  |  |  |
| 47 | 90 | 8943 | 884 |  |  |  |  |  |  |  | $32 \cdot 55$ |  |  |  |  |  |  |  |  |  |  |
|  | 625 | 61 | 6058 | 596 | 586 | 576 | 5671 | 5574 | 547 | 34.538 | 33 |  | 2632 | 2732 | 2833 | 29 |  |  | 3235 |  |  |
| 49 | 346 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0178 |  |  |
| 50 | 0679 | 0578 | 0477 | 0376 | 0276 | 0175 | 1074 | 9973 | 9872 | 35 | 34 | 6386 | 6491 | 6596 | 67 | 68 | 6910 | 7015 | 12 | 722 | 50 |
| 51 | 7892 | 7790 |  | 758 |  |  |  |  | 706 |  | 35＇32 |  |  |  |  |  |  |  |  |  |  |
| 52 | 510 | 500 | 4896 | 479 |  |  | 447 | 137 | 426 | $37 \cdot 41$ | 36.01 |  |  |  | 05 |  |  |  |  |  |  |
| 53 | 231 | 2213 | 2106 | 199 |  |  |  |  | 146 | 38 |  |  |  | 739 |  |  |  |  |  |  |  |
| 54 | 953 | 9424 |  |  |  |  | 8880 |  |  |  |  |  |  | 432 | 4437 |  | 46 | 477 | 4889 |  |  |
| 55 | 674 | 6636 | 6525 |  |  | 619 |  | 5970 | 585 |  |  | 102 |  | 1256 | 137 |  | 160 | 171 | 832 |  |  |
| 56 | 396 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 117 |  |  | 082 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 | 838 | 8270 | 8154 | 8037 |  |  | 7686 | 7569 | 745 | 41 | $40 \cdot 1$ |  |  | 20 | 217 |  |  | 2338 | 2659 |  |  |
| 59 | 560 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 | 2814 | 2694 | 2573 | 2452 | 2331 | 2210 | 2089 | 1967 | 18 | 43.1725 | 41.5538 | 56 | 57 | 59 | 6041 | 61 | 6293 | 6418 | 654 | 666 |  |
| 61 | ． 02 |  |  |  |  |  |  |  |  |  | 42．24 |  |  |  |  |  |  |  |  |  |  |
| 62 | 724 | 711 | 6992 | 686 |  |  |  |  | 624 | 44.6 | $42 \cdot 93$ |  |  |  |  | －03 |  |  | 042 |  |  |
| 63 | 445 | 43 | 4201 |  |  |  | 3693 |  | 34 | 45 | 43 |  |  |  |  |  |  |  |  |  |  |
| 64 |  |  |  |  |  |  |  |  |  |  | $44 \cdot 32$ |  |  |  |  |  |  |  | 矿 |  |  |
| 65 | 888 | 875 | 862 |  | 835 | 822 |  |  |  | $46^{\circ}$ | $45^{\circ} \mathrm{Cl}$ | 030 | 04 | 057 | 07 |  | 09 | 1120 | 125 |  |  |
| 66 | 609 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 33 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 68 | 05 | 03 | 024 |  |  |  |  |  |  |  |  |  |  |  | － |  |  |  | 208 |  |  |
| 69 | 77 | 75 | 745 | 7319 | 7180 |  | 02 | 763 | 662 | 49.648 | 47 | 80 |  | 830 | 84 |  |  |  | 202 |  |  |
| 70 | 495 | 4809 | 668 | 45 |  | 4245 | ， | 3962 |  | $50 \cdot 367$ | $48 \cdot 479$ | 494 |  |  | 硣 |  |  |  | 5968 |  |  |
| 71 |  |  | 1878 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 72 | 937 | 9232 | 9087 | 894 | 879 | 86 | 850 | 83 | 8216 | 51 ＇807 | 49•86 | 879 | 89 |  | 92 |  | 95 | 97 | 98 | －003 |  |
| 73 | 659 | 6444 | 6297 | 615 |  |  |  | 5 | 543 | 52.52 | $50 \cdot 55$ |  |  | 63 | 6183 |  |  |  | 6795 | 6948 |  |
| 74 | 380 | 555 | 3506 | 3357 |  |  | 2909 | 2760 |  | 53. | 51.248 |  | 2807 | 296 | 311 | 32 |  |  | 373 |  |  |
| 75 | 101 | 0867 | 0716 | 0565 | 0413 | 0262 | ＋111 | 9959 |  | 53.9 | 51.94 |  | 97 | 9894 | P05 | 020 | 036 | 05 | 0680 | 083 |  |
| 76 | 823 | 8078 | 7925 | 7772 | 7619 |  | 硣 |  |  | 685 | 52.63 | 650 | 66 |  | 698 |  | 硡 | 746 |  | 寿 |  |
|  | 54 |  |  |  |  |  |  | 1598 | 4203 | 55.4047 | 53．3274 |  |  | ， | 硡 |  |  |  |  |  |  |
| 78 | 2659 | 2502 | 2344 | 218 | 203 | 187 | 1715 | 1558 | 1400 | 56.12 | 54.01 | 036 | 05 | 069 | 085 | 101 | 118 |  | 150 | 167 |  |
| 79 | 987 | 9713 | 9554 | 9395 | 9235 | 9076 | 8917 | 8757 | 8598 | 56.8438 | 54 | 7291 | 7456 | 762 | 7787 | 795 | 8719 | 8284 | 844 | 861 |  |
| 80 | 7086 |  | 6764 | 6 |  | 6280 | 6118 | 5 57 |  | 57．5633 | 55.405 | 42 | 4386 | 4554 | 472 |  |  |  | 539 | 555 |  |
| 81 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 185 |  |  |  |  |  |  |
| 82 | 1513 | 1348 | 1183 | 1017 | 0852 | 068 | 0521 | 035 | 019 | 59.002 | $56 \cdot 79$ | 807 |  | 841 | 85 |  | 893 | ， | 2719 |  |  |
| 8 | 872 | 8559 | 8392 | 8225 | 8057 |  | 7723 | 7555 | 7387 | 59.72 | 57 | 500 | 517 | 5350 | 552 | 569 | 581 | de45 | 219 | 639 |  |
| 84 | 5940 | 5771 | 5602 |  |  |  | 4924 | 4754 | 45 | 60.4415 |  | 192 | 215 | 228 | 245 | 263 | 281 | 29 | ， |  |  |
| 85 | 315 | 2983 | 2811 | 2640 | 2468 | 22 | 2125 | 1954 | 1782 | $61 \cdot 1611$ | 58 | 8857 | 9035 | 9213 | 939 | 9570 | 974 | 9926 | 104 | 028 |  |
| 86 | 0367 | 0194 | P021 | 9847 | 9674 |  | 9327 | 9153 | 898 | 61＇8806 | 59.56 | 5785 | 5965 | 614 |  | 6506 | 668 |  |  |  |  |
|  | 7581 |  | 析 |  |  |  |  |  | 6177 |  | $60 \cdot 253$ | 27 | 285 | ， | 326 | 343 |  |  |  |  |  |
| 88 | 4795 | 4617 | 4440 | 4262 | 408 | 390 | 3730 | 3552 | 337 | $63 \cdot 319$ | 60.945 | 96 | 9825 | －00 | 0194 | 03 | 05 | 07 | 093 |  |  |
| 89 | 2008 | 1829 | 1649 | 147 | 1290 | 1111 | 0931 | 0752 | 0572 | 64．0392 | 61.638 | 6568 | 6754 | 694 | 7128 | 731 | 750 | 7687 | 787 | 806 | 89 |
| 90 | 222 | ， | 8859 |  |  | 8314 |  |  |  | 64.7588 | 62 |  |  |  | 2062 | 25 | 443 | 4627 | 481 | 500 | 90 |
| ， |  |  |  |  |  |  |  |  | 267 |  |  | 73 | 7514 | 773 | 099 | 1186 | 1315 |  | 175 |  |  |
| 92 | 3649 | 3463 | 327 | 309 | 290 | 272 | 2536 | 235 | 216 | 66．1978 | $63 \cdot 715$ | 73 | 75 | 77 | 7930 | 8122 | 83 | 8508 |  |  |  |
| 93 | 0862 | 0675 | 488 | 0300 | 113 | 922 | 9737 | 9550 | 936 | 66.91 | 64．408 | 427 | 4474 | 466 | 486 | 50 | 525 | 5448 | 564 | 㖪 |  |
| 94 | 8076 | 7887 | 697 | 7508 | 731 | 7128 | 6939 | 6749 | 65 | 67.6369 | $65 \% 00$ | 120 | 14 | 160 | 179 | 198 | 219 | 238 |  |  | 94 |
| 95 | 29 | 5098 | 4907 | 4715 |  | 4332 | 4140 | 3948 | 3757 | 68.356 | 65.793 |  | 8333 | 853 | 8732 | 8931 | 9130 | 9329 | 9528 | 972 | 95 |
| 96 | 2503 | 2310 | IT6 | 1923 | 倍 | 1535 | 342 | 1148 | 0954 | 69 | $66^{\circ}$ | 5062 | 5263 | 546 | 5660 | 586 | 6068 | 析 |  |  | 96 |
|  | 977 | 9521 | 9326 | 9130 | 砣 |  | 8543 | 8347 | 8151 | 697956 | 67．1786 | 1990 | 2193 | 2396 | 2600 | 2803 | 300 | 320 | 3413 | 6\％1 |  |
| 98 | 693 | 6733 | 65 | 63 | 6140 | 5942 | 5745 | 5547 | 534 | 70．515 | $67 \cdot 8712$ | 89 | 9123 | 9328 | 953 | 9739 | 99 | －1 | 035 | 056 |  |
| 99 | 4144 | 3944 | 3745 | 3545 | 3346 | 3146 | 46 | 2746 | 2546 | 71．2346 | 68.5637 | 5845 | 6053 | 6260 | 6468 | 6675 | 688 |  | 29 | 550 | 99 |
| 100 | 1357 | 1156 | 0954 | 0753 | 0551 | 0349 | －148 | 9946 | 974 | 71.9542 | 69．2563 | 2773 | 2983 | 3192 | 3402 | 3611 | 3821 | 4030 | 4240 | 4449 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | 7 | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ |  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ |  | $6^{\prime \prime}$ | $5^{\prime}$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| 44 |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $10^{\prime}$ | $11^{\prime}$ | 12 | $13^{\prime}$ | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ | 17 | 18 | $19{ }^{\prime}$ | 10 | 11 | $12^{\prime}$ | 13 | $14^{\prime}$ | $15^{\prime}$ | $16^{\prime}$ | $17^{\prime}$ | 18 |  |  |
|  | 717 | 717 | 716 | 7167 | 7165 | 7163 | 7161 | 7159 | 7157 | 7155 | 6967 | 6970 | 6972 | 6974 | 6976 | 6978 | 6980 | 82 | 6984 | 6986 |  |
|  | 4346 | 4342 | 4338 | 4334 | 4330 | 4326 | 4322 | 4318 | 4314 | 4310 | 3935 | 3939 | 39 | 3947 | 395 | 39 | 3960 | 3964 | 68 | 3972 |  |
|  | 151 | 151 | 15 | 15 | 1495 | 1489 | 1483 | 1477 | 147 | $2 \cdot 1$ | 2.0902 | 0909 | 0915 | 0921 | 0927 | 0934 | 0940 | 0946 | 0952 | 0959 |  |
|  | 8693 | 8685 | 8676 | 8668 | 8660 | 8652 | 8644 | 8636 | 862 |  | 787 | 7878 | 788 | 789 | 7903 | 7912 | 7920 | 7928 | 7937 | 7945 |  |
|  | 5866 | 5856 | 5846 | 5835 | 5825 | 5815 | 5805 | 5795 | 5785 | $3 \cdot 577$ | 4837 | 4848 | 4858 | 486 | 487 | 489 | 490 | 4910 | 4921 | 4931 |  |
| 6 | 303 | 30 | 3015 | 3002 |  | 29 |  |  |  | 4.2929 | 4.1805 | 1817 | 1830 | 1842 | 1855 | 1867 | 1880 | 1892 | 1905 | 1917 |  |
|  | 021 | －138 |  |  |  |  |  |  |  |  |  | 8787 | 880 | 8816 | 8831 | 887 | 8860 | 8874 | 8889 | 898 |  |
|  | 738 | 7369 | 7353 | 7337 | 7320 | 730 | 72 | 7 | 25 | 72 | 5.5740 | 5757 | 577 | 57 | 58 | 5823 | 58 | 5857 | 5873 | 5890 |  |
|  | 4558 | 4540 | 4522 | 4504 | 4485 |  |  |  | 4412 | 6.439 | 6.2707 | 26 | 274 | 276 | 2782 | 2801 | 2820 | 2839 | 2857 | 2876 |  |
| 10 | 1732 | 1711 | 1691 | 16 | 1650 | 1630 | 1610 | 1590 | 1569 | 7.1549 | ． 9675 | 9696 | 9717 | 9737 | 975 | 9779 | 800 | 9821 | 9842 | 9862 |  |
| 11 | 890 | 8882 | 8860 | 8838 | 8816 | 8793 | 8771 | 8749 | 8726 | $7 \cdot 870$ | 7.6642 | 6665 | 6688 | 6711 | 6734 | 6757 | 6780 | 6803 | 6826 | 6849 |  |
| 12 | 60 | 605 | 6029 | 600 | 598 | 5956 |  |  |  |  |  | 3635 | 366 | 368 | 371 | 3735 |  |  |  |  |  |
| 13 | 325 |  |  | 317 | 3146 | 3119 |  |  |  |  |  | 0604 | 0631 |  |  | 0713 |  | （767 | 0794 | 0821 | 1 |
| 14 | 042 | 0396 | 036 | 03 | 0311 | 028 |  | 0225 | 735 | 10.01 | 9.7545 | 7574 | 76 | 7632 | 76 | 7691 |  | 7749 | 7778 | 780 |  |
| 15 | 75971 |  |  |  |  |  |  |  | 735 | $10 \cdot 73$ | 104512 | 4543 | 45 | 4606 | 46 | 46 | 4700 | 4731 | 62 | 4794 | 15 |
| 16 | 47 |  |  |  |  |  |  |  | 4511 | 11.4478 | 11.1480 |  |  |  |  |  | 1680 | 1713 | 1746 |  | 16 |
| 17 | 194 | 190 | 1875 | 1840 |  |  |  |  | 1668 | 12.1 |  |  |  |  |  |  | 8660 | 8695 | 8731 | 8766 | 17 |
| 18 | 91 | 90 | 9044 | 9007 | 89 |  |  |  | 8825 | 12.87 | 12 |  |  |  |  | 5602 |  | 567 | 515 |  |  |
| 19 | 629 | 6252 | 6213 | 617 | 613 |  | 6059 | 6020 | 5982 |  | 13 | 2422 | 246 | 250 | 254 |  | 2620 | 265 | 269 |  | 19 |
| 20 | 3463 | 3423 | 3382 | 3342 | 3301 | 326 | 3220 | 317 | 3139 | 14309 | 13.9350 | 9391 | 9433 | 947 | 951 | 955 | 960 | 964 | 968 | 972 | 20 |
| 21 | 06 | 05 | 0551 | 0509 | 04 | 0423 | 0381 | 0338 | 0295 |  | 14. | 636 | 6405 | 644 | 6492 | 6536 | 6580 | 6623 | 6667 | 671 |  |
| 22 |  |  | 7720 |  |  |  |  |  | 7452 | 呥 | 15.3285 | 3330 | 3376 | 342 |  |  | 560 | 3606 | 365 |  |  |
| 23 | 498 | 493 | 4889 | 48 | 479 | 47 | 4703 | 4656 | 4609 | 16. | 16.0252 | 0300 | 03 | 039 | 044 | 04 | 0540 | 0588 | 0636 | 068 | 23 |
| 24 |  |  |  |  |  |  |  |  |  | 17 | 16.7219 |  | 73 | 73 |  | 7470 | 咗 | 57 | 762 |  |  |
| 25 | 9329 |  |  |  |  |  |  |  |  |  | 17－4187 |  |  |  |  |  | 500 | 55 |  |  | 25 |
| 26 | 650 | 6449 |  | 6344 |  | 6238 | 618 | 6133 | 6080 | 18.602 | 18.1154 | 1209 | 126 |  | 137 |  |  | 153 |  |  | 26 |
| 27 | 367 | 362 |  | 35 | 345 |  |  |  | 3237 |  | 18.8 | 817 | 823 | 829 |  |  |  | 85 | 857 |  |  |
| 28 |  |  | 073 |  |  |  |  | ， | 0394 | 20.0 | $19 \cdot 50$ | 5148 | 5206 |  |  | 5381 | 5440 | 5498 |  | 61 | 28 |
| 29 | 802 | 79 | 790 | 7845 | 77 | 772 |  | 7610 | 7551 | 20 | 20.2 | 21 | 21 | 22 | 22 | 2359 | 2420 | 2480 | 2540 | 260 | 29 |
| 30 | 5195 | 51 | 5073 | 5012 | 4951 | 489 | 4830 | 4769 | 4708 | 21. | 20.902 | 908 | 915 | 9212 | 927 | 933 | 940 | 946 | 952 | 958 | 30 |
| 31 | 2368 | 2305 | 2242 | 2179 | 2117 | 2054 |  | 1928 | 1865 | 22 | 21.5992 | 6057 | 612 |  |  | 6315 |  | 6444 |  |  |  |
| 32 | 95 |  |  |  |  |  | 9152 | 9087 | 902 | 22.89 | 22.2959 |  | 3093 |  |  |  |  |  |  |  |  |
| 33 | 67 | 47 | 6580 | 65 | 64 | 63 | 6313 | 6246 | 6179 | 23 | $22^{\prime} 9$ |  | ＋06 | 013 |  | 0271 | 0340 | 0408 | 047 | 054 | 33 |
| 34 | 388 |  |  |  |  |  |  | 3405 | 3336 | 24 | $23 \cdot 68$ | 6965 | 70 | 710 | 71 | 724 | 732 | 7390 |  | 5 |  |
| 35 | 106 |  |  |  |  |  | 0635 |  |  |  |  |  |  | 408 | 4154 | 422 | 430 | 4372 | 444 | 451 | 35 |
| 36 | 823 | 8161 | 8088 | 8015 | 7942 | 7869 | 7796 | 7723 | 7649 | 25.757 | 25.0829 | 0904 | 097 | 105 | 1130 | 1205 | 1280 | ｜ 1355 | 143 | 150 | 36 |
| 37 | 54 |  | 5257 |  |  |  |  | 4881 | 4806 | 26.47 |  |  |  | 80 |  | 8182 | 820 |  |  |  |  |
| 38 | 25 | 2503 | 2426 |  |  |  | 2118 | 2040 | 1963 | $27 \cdot 18$ | 26 |  |  | 500 | 5081 | 5160 | 5240 | 53 |  |  |  |
| 39 | 97 | 9674 | 959 | 951 |  |  |  |  | 912 |  | 27 | 181 | 188 | 197 |  | 2138 | 2220 | 230 | 238 |  | 39 |
| 40 | 69 | 6845 | 6764 | 6683 | 6602 | 6521 | 6440 | 6358 | 6277 | 28. | $27 \cdot 8699$ | 8783 | 8866 | 8949 | 9033 | 9116 | 200 | 9283 | 366 |  | 40 |
| 41 | 4100 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 | 127 | 118 | ， | 1 |  |  |  | 0676 | 059 |  | 29 |  |  |  |  |  |  |  |  |  | 2 |
| 43 | 844 | 8359 | 82 | 81 |  | 8010 |  | 7835 | 7748 | $30 \cdot 76$ | 29.96 |  |  |  |  | ． 05 | 13 | 022 |  |  | 43 |
| 44 | 561 | 5530 | 5441 |  |  |  |  | 94 | 4905 | 31.48 |  | 6661 | 6753 | 68 | 6936 | 702 | 7119 | 721 |  |  | 44 |
| 45 | 279 | 2701 |  | 251 |  | 2336 |  | 53 |  |  | $31 \cdot 35$ |  | 3724 | 381 | 3912 | 400 | 409 | 419 | 428 |  | 45 |
| 46 | 99 | 9872 | 9779 |  |  |  |  | 9312 |  |  | 32.050 |  |  |  |  |  |  |  |  |  |  |
| 47 | 71 | 7043 | 6948 | 6853 |  |  |  |  | 6376 |  | 32 |  |  |  |  |  |  | 815 | 25 |  |  |
| 48 | 4312 | 4214 | 411 | 40 | 392 | 38 | 372 | 3630 | 3532 | 34 | $33 \cdot 4$ |  | 46 | 47 |  | 493 | 503 | 513 | 52 |  |  |
| 49 | 1485 | 1386 | 128 | 11 |  |  | 08 |  |  | 35.05 |  |  | 16 |  | 18 | 191 | 2019 | 212 | 22 |  | 9 |
| 50 | 8658 | 8557 | 8455 | 8354 | 8252 | 815 | 8049 | 7948 | 7846 | $35 \cdot 7745$ | 34 | 8478 | 8583 | 868 | 8791 | 8895 | 8999 | 911 | 920 | 931 | 50 |
| 51 | 58 | 5728 | 562 | 552 |  |  |  |  |  | 36.49 | 35．534 |  | 5554 |  |  |  |  |  |  |  |  |
| 52 | 300 | 289 | 27 | 2688 |  | 24 |  |  |  | 37 | 36 |  | 25 | 26 |  |  |  |  |  |  | 52 |
| 53 | 017 | －070 | 99 | 98 |  | 96 | 9532 | 9425 | 931 | 37．920 | 36．927 |  | 949 |  |  | 982 | 9939 | ＋05 | 0160 |  |  |
| 54 | 7351 | 7241 | 7132 | 7022 | 691 |  | 693 | 6584 | 6474 | 38. | $37 \cdot 62$ | 63 | 64 |  |  | 680 | 691 | 703 | 71 | 225 | 54 |
| 55 | 4524 | 44 | 430 | 4189 | 4078 |  |  | 3743 |  | 39.35 | $38 \cdot 321$ |  |  |  |  |  |  |  |  | 研 | 55 |
| 56 | 16 | 1584 | 1470 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | 88 | 8755 | 8639 |  |  |  |  | 8061 | 7945 | 40 | 39.7146 |  |  |  |  |  |  |  |  |  |  |
| 58 | 604 | 5926 | 58 | 569 | 557 | 54 | 53 | 5220 | 510 | 41.498 | $40 \cdot 4$ | 42 | 43 | 44 |  | 47 | 483 | 49 | 508 |  |  |
| 59 |  |  |  |  |  |  |  | 379 | 59 | 42.21 | 4.108 | 120 |  |  | 1573 | 69 | 819 | 194 | 206 | 218 |  |
| 60 | 039 | 0268 | 0146 | ． 025 | 9903 | 9781 |  | 9538 | 9416 | 42.929 | 41.8049 | 817 | 8299 |  | 8549 | 867 | 8799 | 892 | 04 | 17 | 60 |
|  | 75 | 7439 | 7315 |  |  | 694 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 | 47 | 4610 | 448 |  | 423 | 4 |  |  |  | 4 | 43 |  |  |  |  |  |  |  |  |  |  |
| 63 |  |  |  |  |  |  |  | 1014 |  | ． 07 |  |  |  |  |  |  |  |  |  |  |  |
| 64 | 9082 | 8953 | 8823 | 8693 | 85 |  |  | 8173 | 8043 | $45 \cdot 79$ | $44 \cdot 59$ | 60 |  | 63 |  |  | 67 | 685 |  |  | 64 |
| 65 | 6255 | 6124 | 5992 |  |  |  |  | 532 |  | 46.506 | 45.288 | 30 |  |  | 28 | 356 | 3699 |  |  | ， | 65 |
| 66 | 34 |  |  |  |  |  |  |  |  | $47 \cdot 22$ |  |  |  |  |  |  |  |  |  |  |  |
| 67 | 060 | ， | 0330 |  |  |  |  |  |  | 47.93 | 46 |  |  | 724 |  | 752 | 7659 | 779 |  |  |  |
| 68 | 777 | 76 | 7499 | 736 | 72 | 7085 |  | 6809 | 667 | 48.653 | 47 |  |  | 421 |  |  | 463 | 478 | 492 |  |  |
| 69 | 49 |  |  |  |  |  |  |  |  |  |  |  |  |  | 1332 | 475 | 619 | 1763 |  |  |  |
| 70 | 212 | 1979 | 1837 | 1695 | 155 | 141 | 1269 | 1127 | 0985 | $50^{\circ}$ | 48.772 | 787 | 801 | 816 | 830 | 845 | 859 | 874 | 889 | 903 | 70 |
| 71 | 92 | 9151 | 90 | 8863 | 8718 | 857 |  | 8286 | 8142 | 50.79 | 49.469 | 1483 | 49 | 51 | 5283 | 5431 |  | 572 | 587 |  |  |
| 72 |  | ， |  |  |  |  |  | 5445 |  | ． 51 | 50．165 | 1878 |  |  |  | 2409 |  | 270 |  |  | 72 |
| 73 | 3641 | 3493 | 3345 | 3197 | 304 | 29 | 2752 | 2604 | 2456 | 52.23 | $50 \cdot 86$ | 877 | 89 | 908 | 9235 | 938 | 953 | 9691 | 98 | 999 | 73 |
| 74 | 0814 | 0664 | 0514 | 036 | 0214 |  | 9913 | 9763 | 9613 | 52.94 | 51.559 | 5748 | 5902 |  | 6211 | 636 | 651 | 6673 | 682 | 6981 | 74 |
| 75 | 798 |  |  |  |  |  |  |  | 6770 |  | 52．25 |  |  |  |  |  |  |  |  |  |  |
| 76 | 5160 | 5006 |  |  |  |  |  | 4081 |  |  |  |  |  |  |  |  | 247 |  |  |  | 76 |
| 77 | 2333 | 2177 | 202 | 18 | 170 | 15 |  | 1240 | 1083 | $55^{\circ} 092$ | 53.649 | 665 | 681 | 69 | 713 | 729 | 7459 | 7619 | 778 | 79 | 77 |
| 78 | 9507 | 848 | 9190 |  |  | ， |  | 矿 | 8240 | 808 |  | 3626 | \％189 |  |  | 427 | 443 | 460 |  |  | 78 |
| 79 | 6680 | 6520 | 6359 | 619 | 6039 | 5879 | 5718 | 5558 | 5397 | $56 \cdot 5237$ | $55^{\circ} 0431$ | 059 | 0760 | 092 | 109 | 1254 | 1419 | 158 | 1748 | 191 | 79 |
| 80 | 38 | 369 | 3528 | 3366 | 320 | 304 | 2879 | 17 | 2554 | 57－2392 | 55.7398 | 75 | 773 | 7899 | 806 | 823 | 8399 | 85 | 873 | 88 | 80 |
| 81 | 102 | 0862 | 0698 |  |  |  |  | 9876 | 711 |  |  | 453 |  | 4873 |  | 5210 | 5379 | 55 | 578 |  |  |
| 82 | 8199 | － 63 |  | 7700 | 7534 |  |  | 㖪 | 686 | 5 | 57 | 1504 | 1675 | 826 | 2017 | ， | 2359 | 253 | 27 |  | 82 |
| 83 | 5372 | 5204 | 503 | 4867 | 469 | 453 | 4362 | 4194 | 4025 | 59.385 | $57 \cdot 830$ | 847 | 8647 | 882 | 8993 | 9166 | 9339 | 951 | 968 | 迷 | 83 |
| 84 | 2546 | 2375 | 2205 | 203 | ， 64 |  |  | 1353 | 182 | 60．101 | 526 | 5443 | 561 |  | 9 | 14 | 631 | 649 | 666 |  |  |
| 05 | 9719 | 9546 | 9374 | 202 | 902 |  |  | 512 |  | 60．81 | 59.22 | 243 | 5 | 276 | 294 |  |  | 347 | 665 |  | 85 |
| 86 | 6892 | 6718 | 6543 | 636 | 619 | 6020 | 5845 | 670 | 5496 | 61.532 | 59．9203 | 938 | 9562 | 974 | 992 | －100 | 0279 | 0458 | 063 |  | 86 |
| 87 | 4065 | 3889 | 3712 | 353 |  | 31 | 3006 | 2829 | 265 | 62.247 | $60 \cdot 617$ | 635 | 65 | 67 | 6896 | 707 | 725 | 7440 | 762 |  |  |
| 88 | 1238 | 1060 | 0881 | 0703 | O52 | 0346 | 132 | 714 | 910 | 62.9 | 61 |  | 35 | 析 | 析 | 4056 | 4239 | 442 | 460 |  | 88 |
| 89 | 8411 | 8231 | 8050 | 787 | 768 | 7509 | 7328 | 7147 | 6967 | 63.678 | 62.010 | 029 | 047 | 06 | 0848 | 1034 | 1219 | 1404 | 159 |  |  |
| 90 | 5584 | 5402 | 5220 | 5037 | 4854 | 4672 | 4489 | 4306 | 4123 | 64：394 | $62 \cdot 7073$ | 726 | 7449 | 7636 | 7824 | 8011 | 819 | 838 | 857 | 87 | 90 |
| 91 | 2758 | 2573 | 2088 | 2371 | d |  |  |  |  |  |  |  |  |  |  |  |  | 矿 |  |  |  |
| 92 | 993 | 9744 | 9558 | 937 | 918 | 899 | 8811 | 8624 | 8437 | 65．8250 | 64．1008 | 1200 | 1392 | 158 | 1776 | 196 | 2159 | 2351 | 254 | 273 |  |
| 93 | 7104 | 6915 | 6727 | 6538 |  | 6161 | 5972 | 5783 | 5594 | $66 \cdot 540$ | 64．797 | 8170 | 8364 | 855 | 8751 | 8945 | 9139 | 9333 | 952 | 972 |  |
| 94 | 4277 | 4087 | 389 | 370 | 35 | 3324 | 3133 | 2942 | 2751 | 67 25 | 654943 | 513 | 53 | 553 | 55 | 592 | 619 | 6315 | 651 |  |  |
| 95 | 14 | 1258 | 1065 | 0872 |  | 0487 | 0294 | 1101 | 9908 | 67.9715 | $66 \cdot 1911$ | 210 | 230 | 2505 | 27 | 2901 | 3099 | 329 | 349 | 369 |  |
| 96 | 8623 | 8429 | 8234 | 8039 | 7845 | 7650 | 7455 | 60 | 706 | 68．6870 | 66．8878 | 9078 | 9278 |  | 9679 | 9879 | －079 | 0279 | 047 | 067 |  |
| 97 | 5797 | 5600 | 54 | 52 | 5015 | 481 | 4616 | 4419 | 4222 | 69•4025 | 67－5845 | 6048 | 6250 | 645 | 6655 | 6857 | 259 | 726 | 463 | 665 |  |
| 98 | 2970 | 2771 | 2572 | 2374 | 2175 | 1976 | 1777 | 1578 | 1379 | 70．118 | 68.28 | 301 | 322 | 34 | 36 | 3835 | 4039 | 4243 | 4427 | 4651 |  |
|  | 43 | 42 | 9741 | 570 | 9340 | 9139 | 8938 | 8737 | 8536 | 70．833 | 68.9780 | 9987 | －193 | 0400 | 0606 | 0813 | 1019 | 225 | 43 | 63 | 99 |
| 100 | 7316 | 7113 | 6911 | 6708 | 6505 | 6302 | 6099 | 5896 | 5693 | 71.549 | $69 \cdot 6748$ | 6957 | 7165 | 7374 | 7582 | 7791 | 7999 | 8207 | 3415 | 623 | 100 |
|  | 50 | $49^{\prime}$ | 48 | 47 | $46^{\prime}$ | 45 | $44^{\prime}$ | 43 | 42 | $41^{\prime}$ |  | $49^{\prime}$ | $48^{\prime}$ | $47^{\prime}$ | $46^{\prime}$ | $45^{\prime}$ | 44 | 1 $43^{\prime}$ |  | $41^{7}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Cos | SINE． |  |  |  |  |  |

TRAVERSE TABLES.


TRAVERSE TABLES．

| Cosine． |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $44^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $30^{\prime}$ | $31^{\prime}$ | $32^{\prime}$ | 33 | $34^{\prime}$ | $35^{\prime}$ | $36^{\prime}$ | $37^{\prime}$ | $38^{\prime}$ |  |  | $31^{\prime}$ | 32 | $33^{\prime}$ | 34 | $35^{\text {r }}$ | 36 | 37 | 38＇ |  |  |
|  | 713 | 713 | 71 | 71 | 712 | 712 | 712 | 71 | 711 | 7114 | 700 | 7011 | 7013 | 7015 | 017 | 1919 | 7022 | 7024 |  |  |  |
|  | 24265 | 426 | 4257 | 4253 | 4249 | 4245 | 42 | 42 | 4232 | $1 \cdot 42$ | 140 | 4022 | 4026 | 4031 | 4035 | 4039 | 4043 | 40 | 40 | 4055 |  |
|  | 1398 | 1391 | 1385 | 1379 | 1373 | 1367 | 136 | 13 | 1349 | $2 \cdot 1342$ | ${ }^{1} 1027$ | 1034 | 1040 | 1046 | 1052 | 1058 | 1065 | 1071 | 1077 | 1 |  |
|  | 8530 | 8522 | 8514 | 8506 | 8497 | 8489 | 848 | 84 | 8465 | 2.845 | 2．8036 | 8045 | 8053 | 8061 | 8070 | 8078 | 8086 | 809 | 810 | 8111 |  |
|  | 566 | 5652 | 564 | 5632 | 5622 | 5612 | 560 | 55 | 5581 | $3 \cdot 557$ | 045 | 056 | 506 | 5077 | 508 | 509 | 5 | 51 | 5128 | 5139 |  |
|  | 279 | 278 | 2771 | 2758 | 2746 | 27 | 27 | 2709 | 2697 | 4.2685 | 4.2055 | 2067 | 2079 | 2092 | 2104 | 2117 | 2129 | 2142 | 2154 | 2166 |  |
|  | 992 | 9913 |  |  | 981 | 98 | 9842 | 98 | 9813 | 97913 | 9063 | 90 | 90 | 910 | 912 | 913 | 915 | 91 | 91 | 91 |  |
|  | 7060 | 7044 | 7027 | 70 | 695， | 697 | 69 | 6946 | 6929 | ＇69 | 607 | 60 | 6106 | 6123 | 6139 | 6156 | 617 | 61 | 6205 | 6222 |  |
|  | 4193 | 4174 | 4156 | 4137 | 4119 | 4101 | 40 | 4064 | 4046 | 402 | 6．308 | 310 | 3119 | 3138 | 31 | 3175 | 31 | 321 | 323 | 32 |  |
| 0 | 1325 | 1305 | 1284 | 1264 | 1243 | 1223 | 1203 | 1182 | 1162 | ． 114 | 7．0091 | 0112 | 0132 | 0153 | 0174 | 0195 | 0215 | 0236 | 0257 | 0277 | 10 |
| 11 | 8458 | S435 | 8413 | 83 | 2368 | 183 | 83 |  | 8278 | $7 \cdot 8255$ | 77100 | 7123 | 7146 | 7168 |  | 7214 |  |  |  |  | 1 |
| 2 | 559 | 5566 | 554 | 551 | 54 | 54 | 5443 | 5419 | 5394 | 53 | 410 | 413 | 4159 | 41 | 42 | 4234 | 4258 | 4283 | 4308 |  | 12 |
| 13 | 2723 | 96 | 2670 | 543 | 616 | 25 | 25 | 2537 | 2510 | 24 | 9.1118 | 1145 | 1172 | 1199 | 1226 | 1253 | 128 | 130 | 13 | 13 | 13 |
| 14 | 9855 | 9827 | 979 | 9769 | 9741 | 971 | 96 | 9655 | 9626 | ． 959 | 812 | 8156 | 8185 | 8214 | 8243 | 8272 | 8301 | 833 | 835 | 838 | 14 |
| 15 | 6988 | 6957 | 6926 | 6896 | 65 | 6835 | 6804 | 6773 | 6743 | $10 \cdot 6712$ | 0.5136 | 5168 | 5199 | 5230 | 5261 | 5292 | 532 | 535 | 53 | 54 | 15 |
| 16 | 4120 | 4087 | 4055 | 4022 | 3990 | 3957 | 3924 | 3891 | 3859 | 11.3826 | 11.21 | 21 | 22 | 2245 | 2278 | 23 | 2344 | 2378 | 241 | 2444 | 16 |
|  | 1253 | 1218 | 11 | 174 | 1114 | 1079 | 10 | 1 | 0975 | 12.0940 | 11.9155 | 9190 | 9225 | 9260 | 9296 | 933 | 936 | 94 | 9436 | 9472 | 7 |
| 18 | 8385 | 8348 | 8312 | 8275 | 8238 | 8201 | 81 | 8128 | 809 | 12.80 | 12.6164 | 6201 | 62 | 6276 | 631 | 635 | 638 | 64 | 6462 | 64 | 18 |
| 19 | 551 | 5479 | 5440 | 54， | 5363 | 5324 | 52 |  | 5207 | 13.5168 | 13.3173 | 3212 | 3252 | 3291 | 3330 | 337 | 340 | 344 | 34 | 352 | 19 |
| 20 | 265 | 2609 |  | 2528 | 2487 |  | 2405 |  | 323 | 14.2283 |  | 0223 | 0265 | 3306 | ， | 038 | 04 | 0472 | 0513 | 555 | 20 |
| 21 | 978 | 9740 | 9697 | 9654 | 96 | 9568 | 9525 | 9483 | 9440 | 14.9397 | 71 | 7235 | 7278 | 7322 | 7365 | 7409 | 745 |  |  |  | 21 |
| 22 | 6915 | 687 | 682 | 678 | 673 | 669 | 66 | 660 | 65 | 15.65 | 15.42 | 42 | 42 | 43 | 438 | 442 | 44 | 45 | 456 | 46 | 22 |
| 23 | 4048 | 400 | 3954 | 3907 | 3860 | 3813 | 37 |  | 3672 | 16.362 | $16 \cdot 12$ | 12 | 13 | 13 | 1400 | 144 | 149 | 15 | 15 | 1638 | 23 |
| 24 | 1180 | 1131 | 1082 | 1033 | 0984 | 0935 | 0886 | 08 | 0788 | 17.07 | 16.82 | 82 | 83 | 83 | 17 | 8467 | 85 | 85 | 861 | 8666 | 24 |
| 25 | 8313 | 62 | 8211 | 8160 | 8109 | 8058 | 8007 | 7955 | 7904 | 177853 | $17 \cdot 5227$ | 52 | 53 | 53 | 35 | 5486 | 553 | 559 | 56 | 5694 | 25 |
| 26 | 54 | 53 | 5339 | 5286 | 5233 | 5180 | 5127 |  |  | 18.4967 | 36 | 2290 | 2344 | 2398 | 2452 | 2506 | 256 | 2614 | 2667 | 2721 | 26 |
| 27 | 257 |  | 析 |  | 235 | 2302 |  |  |  | 傀 | 18.9246 | 93 |  | 9413 | 9469 | 95 | 9581 | 963 | 9693 | 9749 | 27 |
| 28 | 971 | 96 | 9596 | 95 | 948 | 9424 | 93 | 9310 | 9253 | 19.9 | 19.6 | 63 | 63 | 64 | 64 | 654 | 6603 | 666 | 671 | 677 | 28 |
| 29 | 6843 |  |  | 源 | 66 |  | 6488 |  |  | 20．6310 | 20.326 | 3324 | 3384 | 34 | 350 | 356 | 362 | 36 | 37 | 3804 | 29 |
| 0 | 3975 | 3914 | 3853 | 3792 | 3730 | 669 | 3608 | 47 | 3485 | 21.3424 | 0273 | 03 | 0397 | 0459 | 0522 | 05 | 0646 | 0708 | 0770 | 83 | 30 |
| 31 | 1108 | 1044 | 0981 | 0918 | 0855 | 0791 | 0728 | 0665 | 0601 | 22 | 21.7282 | 7346 | 7 | 7475 | 75 | 7603 | 766 | 773 | 7796 | 7860 | 31 |
| 32 | 82 | 8175 | 8110 | 8044 | 7979 | 7914 | 7848 |  | 7718 | 22 | $22 \cdot 42$ | 43 | 44 | 44 | 455 | 46 | 46 | 475 | 48 | 488 | 32 |
| 33 | 537 | 53 | 5238 | 5171 | 5103 | 5036 | 49 | 490 | 48 | 23. | 23.13 | 13 | 14 | 1505 | 1574 | 164 | 171 | 177 |  | 1915 | 33 |
| 34 | 250 | 24 | 2366 | 2297 | 2228 | 2158 | 2089 | 2019 | 1950 | 24 | 23＇8309 | 83 | 84 | 8521 | 8591 | 866 | 8732 | 8802 | 887 | 8943 | 34 |
| 35 | 9638 | 9566 | 9495 | 9423 | 9352 |  |  | 9138 | 9066 | 24.8995 | $24 \cdot 5318$ | 5391 | 5463 | 55 | 5609 | 568 | 575 | 582 | 58 | 59 | 35 |
| 36 | 6770 | 669 | 6623 | 6550 |  |  |  |  |  | $25 \cdot 610$ | $25 \cdot 2327$ | 2402 | 2477 |  | 2626 | 2701 | 2775 | 2850 |  |  | 36 |
| 37 | 3903 | 382 | 3752 | 3676 | 601 | 3525 | 3450 | 337 | 329 | $26 \cdot 3$ | 25.93 | 94 | 94 |  | 96.43 | 972 | 979 | 987 |  | ， 26 | 37 |
| 38 | 103 | 09 | 08 | 0803 | 0725 | 0648 | 0570 | 0492 | 04 | 27.03 | $26^{\prime} 63$ | 642 | 6503 | 65 | 6661 | 673 | 681 | 689 | 6976 | 7054 | 38 |
| 39 | 8168 | 808 |  | 7929 | 78 | 7770 | 769 |  | 753 | 27.745 | 27.33 | 34 | 3516 | 359 | 3678 | 375 | 384 | 392 | 400 | 4082 | 39 |
| 40 | 5300 | 5219 | 5137 | 55 | 4974 | 4892 | 4810 | 4729 | 4647 | 28.4565 | 28.03 | 04 | 0530 | 0613 | 0695 | 077 | 086 | 00 | 102 | 111 | 40 |
| 41 | 24 | 2349 | 2265 | 2182 | 2098 | 2014 | 1931 | 1847 | 1763 | 29•1679 | 28.7373 | 7458 | 7543 | 7628 | 7713 | 7798 | 7883 | 796 | 8053 | 8137 |  |
|  | 956 |  |  | 9308 | 9222 | 9137 | 90 |  | 8879 | 29.8793 | 29 | 4469 | 4556 | 464 | 47 | 481 | 490 | 49 | 507 |  | 2 |
| 43 | 669 | 661 | 652 | 643 | 63 | 62 | 6171 | 6083 | 59 | 30. | $30 \cdot 13$ | 148 | 15 | 165 | 174 | 183 | 192 | 20 | 21 | 2193 | 43 |
| 44 | 3830 | 37 | 651 | 61 | 3471 | 3381 | 3291 | 3202 | 31 | 31.30 | $30 \cdot 840$ | 8491 | 858 | 867 | 876 | 885 | 894 | 903 |  | 202 | 44 |
| 45 | 096 | 087 | 0779 | 0687 | 0595 | 0504 | 12 | 0320 | 0228 | 32．0136 | 315409 | 5503 | 5596 | 5689 | 578 | 58 | 59 | 6062 | 6155 | 6248 | 45 |
| 46 | 8095 | 8001 | 7908 | 7814 | 7720 | 7626 | 7532 | 74 | 7344 | 32. | 32 | 25 | 260 | 27 | 280 | 2895 | 2990 | 308 |  |  | 46 |
| 47 | 5228 | 51 | 5036 | 4940 | 4844 | 4748 | 4652 | 4556 | 4460 | 33 | 32 | 95 | 9622 |  | 981 | 9915 | ＋01 | 01 | 020 | 030 | 47 |
| 48 | 236 | 22 | 2164 | 2066 | 1969 | 1871 | 1772 | 16 | 76 | 34. | 33.64 | 65 | 66 | 67 | 683 | 693 | 703 | 713 | 723 |  | 48 |
| 49 | 949 |  |  |  |  | 8993 |  | 87 | 8693 | 34 | $34 \cdot 34$ | 35 |  | 37 | 385 | 395 | 405 | 415 | 4258 | 43 | 49 |
| 50 | 6625 | 65 | 6421 | 6319 | 621 | 6115 | 13 | 5911 | 5809 | $35 \cdot 5707$ | 35．0455 | 0558 | 0662 | 076 | 0869 | 0973 | 107 | 1180 | 1284 | 1387 | 50 |
|  | 375 | 3654 | 3550 | 3446 | 3342 | 3237 | 3133 | 3029 | 2925 | 36 | 35 | 7570 | 7675 |  | 7887 | 79 | 8098 | 8204 | 8309 |  |  |
| 52 | 089 | 07 | 067 | 0572 | 0466 | 0360 | 0254 | 0147 | －041 | 36. | 36. |  | 4689 | 479 | 4904 | 5012 | 512 | 52 | 5335 |  | 52 |
| 53 | 802 | 79 | 78 | 7698 | 7590 | 7482 | 7374 | 266 |  | $37^{\circ}$ | $37 \cdot 14$ |  | 17 | 1812 | 192 | 2031 | 214 | 225 | 236 | 247 | 53 |
| 54 | 5155 | 5045 | 4935 | 4825 | 4715 | 604 | 4494 | 4384 | 273 | 38. | $37 \cdot 84$ | 86 | 87 | 8827 | 893 | 905 | 916 | 927 | 938 | 949 | 54 |
| 55 | 228 | 217 |  |  | 18 | 1727 | 1614 | 1502 | 1390 | $39 \cdot 1277$ | 38.5500 | 5614 | 5728 | 5842 | 5956 | 607 | 6184 | 6298 |  | 652 | 55 |
| 56 | 9420 |  |  | 9078 | 8963 | 8849 |  | 8620 | 850 |  | 39.25 | 26 | 27 | 285 | 297 | 3090 | 320 | 3322 | 3438 |  | 56 |
|  | 6553 |  | 6320 | 6204 | 6088 | 5971 | 5855 |  | 5622 | 40 | 39.95 | 963 |  |  | 999 | －109 | 022 |  |  |  | 57 |
| 58 | 3685 | 35 | 1577 | 330 | 3212 | 3094 | 2975 | 28 | 2738 | 41.26 | 40.65 | 6648 | 6768 | 688 | 7008 | 7129 | 724 |  |  |  | 58 |
| 59 | 0818 | 06 | 05 |  | 0336 | 0216 | －095 | 997 |  | 41.97 | $41 \cdot 353$ | 365 |  | 39 | 402 | 4148 | 4270 | 4392 | 4515 | 46 | 59 |
| 60 | 79 | 7828 | 7706 | 7583 | 7461 | 7338 | 7216 | 7093 | 6970 | 42.6 | 42.054 | 067 | 079 | 091 | 1043 | 1168 | 1292 | 141 | 1540 | 166 | 60 |
| 61 | 50 |  | 4834 |  |  | 4460 |  |  | 408 | $43^{\circ} 396$ | $\frac{12 \cdot 7555}{4}$ |  |  |  |  |  |  |  |  |  |  |
| 62 | 2215 | 20 | 19 | 18 |  | 1583 | 145 |  | 1203 | 44．107 | 43.456 | 4692 | 4821 | 494 | 507 | 520 | 533 | 546 | 559 | 57 | 62 |
|  |  |  |  |  |  | 87 | 85 |  | 8319 | 44.819 | 44.15 | 1704 | 1834 | 196 | 2095 | 222 | 23 | 248 | 26 | 27 | 63 |
| 64 | 6480 | 63 | 621 | 18 | 59 | 5827 | 5697 | 5566 | 5435 | $45 \cdot 5304$ | 44.85 | 8715 | 8847 | 8980 | 9113 | 924 | 937 | 951 | 201 | 2775 | 64 |
| 65 | 36 |  |  |  |  |  | 2817 |  |  | $46^{\circ}$ | 45.559 | 572 | 58 | 59 | 613 | 626 | 64 | 653 |  | 68 | 65 |
| 66 | 0781 |  |  |  |  | 8072 | 9937 | 98802 |  | 46.9 | 46.2600 | 2737 | 287 |  |  |  |  |  |  |  | 66 |
| 67 | 787 |  | 760 |  |  | 7194 | 7057 | 692 |  | $47 \cdot 664$ | 46.9609 | 9748 |  | －02 |  | 030 | －21 | － |  |  | 67 |
| 6 | 50 | 48 | 473 | 4594 | 44 | 4317 | 4178 | 4039 | 3900 | $48 \cdot 376$ | 47．6618 | 6759 | 6900 | 704 | 718 | 7323 | 746 | 7605 | 774 | 7 | 68 |
| 6 |  |  |  |  |  | 1439 | 129 |  |  | 49.087 | $48 \cdot 3627$ | 3771 | 391 | 405 | 420 | 4343 | 448 | 462 | 477 | 49 | 69 |
| 70 | 9275 | 9133 | 8990 | 8847 | 8704 | 8561 | 8418 | 8275 | 813 | 49.798 | 49.063 | 0782 | 092 | 107 | 121 | 136 | 150 | 165 | 179 | 481 | 70 |
| 71 | 64 | 62 | 6118 | 5973 | 58 | 5684 | 5538 | 5393 | 5248 | 50．510 | 49.7 | 779 | 79 | 808 | 823 | 8382 | 5 | 867 |  |  | 71 |
|  |  |  |  |  | 20 | 2806 | 2659 | 2512 | 2365 | 51.2217 | 50.465 | 480 | 495 | 5103 | 525 | 540 | 55 | 569 | 58 | 59 | 72 |
| 73 | 0673 | 0524 | 0375 | 0226 | －077 | 9928 | 9779 | 9630 | 9481 | 51.9331 | 51.1664 | 181 |  | 2118 | 2269 | 2421 | 2572 | 272 | 287 | 502 | 73 |
| 74 | 7805 | 7654 | 75 | 7352 | 720 | 7050 | 6899 | 6748 | 6597 | $52 \cdot 6446$ | 51．8673 | 882 | 898 | 9133 | 9287 | 9440 | 9593 | 9746 | 990 | ＋053 | 析 |
| 75 | 4938 | 47 |  | 4479 | 432 | 4173 |  |  |  | 53＇3560 | 52.5682 |  |  | 913 | 6304 | 6459 | 6615 | 6770 | 692 | 7081 | 75 |
| 76 | 2070 | 1915 | 1760 |  | 857 | 54 | 1140 | 0985 | 729 | 55 | 53.26 | 2849 |  | 3164 | 33 |  |  | 378 |  | 41 | 77 |
| 77 | 9203 | 90 | 88 | 8732 | 857 569 | 8417 5540 | 8260 5380 | 8103 | 7945 | 年57788 | 53.9700 | 9860 | ＋020 | 0179 | 0339 | 0498 | 0658 | 0817 | 81 |  | 77 |
| 78 | 6335 | ， | 6017 | 5858 | 5699 | 5540 | 5380 | 522 | 5062 | 55．4902 | 54.670 | 6871 | 7033 | 7194 | 7356 | 7518 | 7679 | 784 | 800 | 81 | 78 |
| 79 | 3468 | 3307 | 3146 | 2984 | 2823 | 2662 | 2501 | 2339 | 2178 | 56．2016 | 55．3718 | 3882 | 4046 | 4210 | 4374 | 4537 | 470 | 486 | 202 |  | 79 |
| 80 | 06 | 0437 | 0274 | 1 | 9948 | 9784 | 9621 | 9457 | 9294 | 56.9130 | 56.0727 | 0893 | 1059 | 1225 | 1391 | 155 | 1722 | 188 | 205 | 2219 | 8 |
| 81 | 7733 |  | 7403 |  | 7072 | 907 | 6741 | 6576 | 6410 | 57．6245 | 56.7737 | 7905 | 807 | 824 | 8408 | 8576 | 874 | 891 | 907 | 92 | 81 |
| 82 | 486 | 4698 | 4531 | 4364 | 4196 | 40 | 38 | － | O21 | 58：3359 | 57.4746 | 4916 | 508 | 525 | 542 | 559 | 5766 | 593 | 610 | 627 | 82 |
| 83 | 199 | 18 | 1659 | 149 | 1321 | 11 | 0982 | 0812 | 0642 | 59.0473 59 | 58．175 | 1927 | 209 | 2271 | 2443 | 2615 | 2787 | 295 |  | ） | 83 |
| 84 | 9130 | 8959 | 898 | 8616 | 844 | 8273 | 8122 | 793 | 7759 | 59．7587 | 58.876 | 8938 | 9112 | 928 | 946 | 963 | 980 | 998 | ＋i5 | 033 | 84 |
| 85 | 6263 | 6090 | 591 | 5743 | 5569 | 5396 | 5222 | 5049 | 4875 | 60．4701 | $59 \cdot 577$ | 529 | 1 | 630 | 647 | 665 | 矿 | 700 | ， | 73 | 85 |
| 86 | 3395 | 3220 | 3045 | 2869 | 2694 | 2518 | 342 | 2167 | 1991 | 61.1815 | 60.2782 | 2960 | 13 | 3317 | 3495 | 3673 | 585 |  |  |  | 86 |
| 8 | 0528 | 0350 | ＋173 | 9995 | 9818 | 9640 | 9463 | 9285 | 9107 | 61－8929 | 60.979 | 9972 | －152 | 0332 | 0513 | 0693 | 087 | 1053 | 1233 | 141 | 87 |
| 88 | 7660 | 7481 | 7301 | 7122 | 6942 | 6763 | 6583 | 6403 | 6223 | $62 \cdot 6043$ | 61．6800 | 6983 | 7165 | 7348 | 7530 | 7712 | 789 | 807 | 825 | 84 | 88 |
| 89 | 4793 | 4611 | 4430 | 4248 | 4066 | 3885 | 703 | 3521 | 3339 | 63.3158 | 62．3809 | 3994 | 4178 | 4363 | 4547 | 4732 | 4916 | 5100 | 5285 | 546 | 89 |
| 90 | 1925 | 1742 | 155 | 1375 | 11 | 10 | 0823 | 0640 | 0456 | 64．0272 | 63.0818 | 1005 | 1192 | 1378 | 1565 | 175 | 1938 | 2124 | 2510 | 2497 | 90 |
| 91 | 9058 | 8872 | 8687 | 8501 | 815 | 8130 | 7944 | 758 | 7572 | 64738 |  | 801 | 820 |  |  | 877 | 995 | 9148 | 9336 | 95 | 91 |
| 92 | 619 | 6003 | 5815 | 5627 | 5440 | 5252 | 5064 | 4876 | 4688 | $65 \cdot 4500$ | 64．4837 | 5027 | 5218 | 5409 | 5600 | 5790 | 5981 | 6171 | 6362 |  | 92 |
| 93 | 3323 | 3133 | 2944 | 275 | 2564 | 2374 | 2184 | 1994 | 1804 | 66.1614 | 65．1846 | 2039 | 2231 | 2424 | 2617 | 2810 | 3002 | 3195 | 3387 | 358 | 93 |
| 94 | 0455 | 0264 | ＋072 | 988 | 9688 | 9496 | 9304 | 9112 | 8920 | $66 \cdot 8728$ | 65．8855 | 95 | 9245 | 9440 | 9634 | 982 | ${ }^{102}$ | 0218 | 0413 | 析 | 析 |
| 95 | 75 | 7394 | 7200 | 7007 | 6813 | 6619 | 625 | 6231 | 6037 | $67 \cdot 5842$ | 66．5864 | 606 | 6258 | 645 | 6652 | 684 | 7045 | 728 | 仡 | 763 | 95 |
| 96 | 4720 | 4525 | 4329 | 4133 | 3937 | 3741 | 3545 | 3349 | 3153 | 68.2956 | 67.2873 | 3072 | 3271 | 3470 | 3669 | 3868 | 4067 | 4266 | 4465 | 4663 | 96 |
| 97 | 185 | 165 | 14 | 125 | 181 | 08 | 0665 | 0467 | 0269 | 69．0071 | 67－9882 | ¢083 | 0284 | 0485 | 0687 | 0888 | 1089 | 1289 | 1490 | 169 | 97 |
| 98 | 8985 | 8786 | 8586 | 8386 | 8186 | 7986 | 7785 | 7585 | 7385 | 69.7185 | 68.6891 | 7094 | 7298 | 750 | 7704 | 7907 | 8110 | 8313 | 8516 | 8719 | 8 |
| 100 | 6118 | 5916 | 5714 | 55 | 51 | 5108 | 4906 | 4704 | 4501 | 70．4299 | 69．3900 | 4106 | 4311 | 4516 | 4721 | 4926 | 5132 | 5336 | 5542 | 5746 | 9 |
| 100 | 3250 | 3047 | 2843 | 2639 | 2434 | 2230 | 2026 | 1822 | 1617 | 71.1413 | 70.0909 | 1117 | 1324 | 1531 | 1739 | 1946 | 2153 | 2360 | 2567 | 2774 | 100 |
|  | $30^{\prime}$ | $2 y^{\prime}$ | $28^{\prime}$ | 27 | $26^{\prime}$ | 25 | 24 | 23 | $22^{\prime}$ | $21^{\prime}$ | $30^{\prime}$ | $29^{\prime}$ | $28^{\prime}$ | $27^{\circ}$ | $26^{\circ}$ | $25^{\prime}$ | $2^{11}$ |  | 2567 | 21 |  |
| 45 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | NE． |  |  |  |  | $45^{\circ}$ |

TRAVERSE TABLES．

| $44^{\circ}$ |  |  |  |  | Cosine． |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  | $44^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $40^{\prime}$ | $41^{\prime}$ | 42＇ | $43^{\prime}$ | 44＇ | $45^{\prime}$ | 46 | 47＇ | $48^{\prime}$ | 49 | $40^{\prime}$ | $41^{\prime}$ | $42^{\prime}$ | 43 | 44＇ | $45^{\prime}$ | $46^{\prime}$ | $47^{\prime}$ | 48 | $49^{\prime}$ |  |
|  | 71 | 7110 | 7108 | 7106 | 7104 | 7102 | 7100 | 7098 | 7096 | 709 | 230 | 7032 | 7034 | 7036 | 703 | 704 | 7042 | 7044 | 7046 |  |  |
|  |  | 4220 | 42 | 4212 |  | 4204 | 4200 | 4196 | 4191 | 418 | 60 | 4064 | 4068 | 4072 | 407 | 408 | 40 | 408 | 4093 |  |  |
|  |  | 13 | 1324 |  |  | 1306 |  | 1293 | 1287 | $2 \cdot 128$ |  | 1096 | ， | 108 | 114 | 120 | 127 | 133 | 1139 | 1145 |  |
|  | 8448 | 8440 | 8432 | 24 | 8416 | 8407 | 8399 | 123 | 838 | 837 | 1 | 8128 | 36 | 8144 | 8152 | 816 | 8169 | 8177 | 8185 | 119 |  |
|  | 55 | 5550 | 5540 | 5530 |  |  |  | 5489 |  | ． 54 | 49 | 59 | 5170 | 180 | 5190 | 201 | 521 | 5221 | 5232 | 5242 |  |
|  | 2673 | 2660 | 2648 | 336 | 2623 | 2611 |  |  | 2574 | 4.2562 | 2179 | 2191 | 2204 | 2216 | 228 | 241 | 2253 | 2266 | 2278 |  |  |
|  | 978 |  |  |  |  |  |  | 8 | 967 | 962 |  | 9223 | 238 | 9252 | 226 | 928 | 295 | 9310 | 234 |  |  |
|  | 689 | 6880 | 68 | 68 | 6831 | 68 | 98 | 67 | 6766 | 676 | 623 | 6255 | 6272 | 6288 | 630 | 632 | 63 | 6354 | 371 | 638 |  |
|  | 400 |  |  |  |  |  | 98 | so | 3861 | 6.384 | －3268 | 32 | 3306 | 3324 | 3343 | 336 | 338 | 3399 | 3417 | 3436 |  |
| 10 | 11 |  |  |  |  | 1019 | 98 | 78 | 0957 | 7.0937 | 298 | 0319 | 0339 | 0360 | 038 | 040 | 042 | 0443 | 463 | 0484 | 10 |
| 11 | 82 | 8210 |  |  |  | 8120 | 8098 | 8075 | 805 | $7 \cdot 8030$ | 7328 | 7351 | 737 |  | 741 | 744 |  |  |  |  |  |
| 12 | 5345 | 53 | 5 |  |  | 522 | 5198 | 5173 | 5148 |  |  |  |  | 4432 |  | 4482 | 4507 |  | 4556 |  | 12 |
| 13 | 2457 |  |  | 2377 | 23 | 23 | 2297 | 2271 | 2244 | 9.2218 |  |  |  | 1468 | 149 | 1522 | 1549 | 1576 | 1602 |  | 13 |
| 14 | 956 | 9541 | 9512 | 83 | 94 | 942 | 939 | 9369 |  | $9 \cdot 931$ | 9．8417 |  | 847 | 850 | 853 | 856 | 859 | 8620 | 8649 |  | 14 |
| 15 | 66 | 6651 | 6620 | 6589 | 6559 | 6528 |  |  | 6436 | 10.6405 | 10.5447 |  | 55 | 55 | 5571 |  | 5633 | 64 | 5695 | 5726 | 15 |
| 16 | 379 |  |  |  |  |  |  |  | 3531 | 11.3499 | 11.2477 | 12510 | 2543 | 2576 | 2609 | 2642 | 2675 | 2708 | 2741 | 2774 | 16 |
| 17 | 090 |  |  | 0801 |  |  |  |  | 0627 | 12 | 11 | 95 | 95 | 9612 | 96 | 9682 | 18 | 53 | 9788 |  | 17 |
| 18 | 8018 | 798 | 7944 | 7907 |  | 7833 | 779 |  |  | 12.7 | 12.6537 |  | 6611 | 6648 | 6685 | 23 | 60 | 97 | 6834 |  | 18 |
| 19 |  |  |  |  |  | 4935 | 489 | 4857 | 18 | 13. |  | 3606 | 645 | 368 | 3724 | 3763 | 3802 | 3841 |  |  | 19 |
| 20 | 224 | 2201 | 60 | 2119 | 2078 | 2037 | 96 | 1955 | 14 | 14．1873 | 14.05 | 0638 | 0679 | 072 | 07 | 0803 | 0844 | 888 | 0927 |  | 20 |
| 21 | 935 | 9311 | 92 | 9225 | 9182 | 9139 | 9096 | 9053 | 9010 | 14.8967 | 14 |  | 7713 |  |  | 884 |  |  |  |  | 21 |
| 22 | 64 |  |  |  |  |  |  |  | 6106 | 15.606 | $15 \cdot 4656$ | 4701 | 47 | 4792 | 4838 | 4883 | 492 | 4974 | 5020 | 065 | 22 |
| 23 | 357 |  |  |  |  | 3343 | 3296 | 3248 | 3201 | 16.315 | 16.1 | 1733 | 1781 | 182 | 18 | 1923 | 197 | 2018 |  |  | 23 |
| 24 | 069 |  | 0592 |  |  |  |  |  |  | 17.02 |  | 8765 | 8815 | 88 | 89 | 8964 | 9013 |  | 112 |  | 24 |
| 25 | 78 |  |  |  |  |  |  |  |  |  |  |  |  |  | 5952 | 004 | 05 | 107 | 159 |  | 25 |
| 26 | 491 |  |  |  |  |  |  |  |  | 18.443 | 18 | 2829 | 2883 | 2936 | 29 | 3044 | 3098 | 3151 | 3205 | 3259 | 26 |
| 27 | 202 |  |  |  |  | 175 |  |  |  |  |  | 9861 | 991 | 99 | －0 |  |  |  |  |  | 27 |
| 28 | 913 |  |  |  |  |  |  |  |  | 19．862 | 19 | 6893 | 69 | 7008 | 70 | 7124 | 718 | 40 | 7298 | 7355 | 28 |
| 29 | 625 |  | 32 | 6072 |  |  |  |  | 5776 | 20 | 20 | 3924 | 398 | 40 | 41 | 4164 | 4224 | 4284 | 4344 |  | 29 |
| 30 | 336 | 330 | 40 |  | 3117 | 2056 | 2994 | 2933 | 2871 | 21.2810 | 21.0894 | 095 | 1018 | 1080 | 142 | 1204 | 1266 | 1328 | 1390 | 1452 | 30 |
| 31 | 04 | 0411 | 0348 | 0284 | 0221 | 0157 | 0094 | ＋030 | 9967 | 21.990 | 21.792 |  | 8052 |  |  |  |  |  |  |  |  |
|  | 75 |  |  |  |  |  |  |  | 6 |  | 2 |  | 508 |  |  |  |  |  |  |  |  |
| 33 | 469 | 4631 | 4564 | 4496 | 442 | 436 | 4294 | 4226 | 4158 | $23 \cdot 40$ | 23 | 2052 | 212 | 218 | 2257 | 2325 | 2393 | 2461 | 2529 |  |  |
| 34 | 18 | 1741 | 1672 | 1602 |  |  |  |  |  | $24 \cdot 11$ | 23.9014 |  | 9154 | 922 | 9295 | S | 9435 | 655 | 95 | 9646 | 34 |
| 35 | 89 | 885 | 8780 | 870 |  |  |  |  |  |  | 24 |  | 618 | 626 | 6333 | 640 | 647 | 65 | 6622 | 669 | 3 |
| 36 | 603 |  |  |  |  |  |  |  |  | 25.537 | $25 \cdot 3073$ | 3148 | 32 | 3297 | 3371 | 3445 | 3520 | 3594 |  |  |  |
| 37 | 314 |  |  | 292 |  |  |  |  |  | 26.24 | 26.0103 | 0180 | 02 |  |  | 0485 | 05 |  |  | 0791 | 37 |
| 38 | 025 |  | 0104 | ＋026 |  |  |  |  | 矿 | 26 | 26.7133 |  |  |  |  | 526 | 760 | 768 | 7761 | 7839 | 38 |
| 39 | 7371 | 7292 |  | 7132 | 7052 | 69 |  |  | 33 | 27 | 27.41 | 4243 | 4324 | 4405 | 4485 |  | 464 | 472 |  |  | 39 |
| 40 | 4483 | 4402 | 43 | 4238 | 415 | 407 | 399 | 10 | 3828 | 28.37 | 28.1192 | 1275 | 1358 | 1441 | 1523 | 1606 | 1689 | 1771 | 1854 | 1936 | 40 |
| 41 | 1596 | 1512 | 1428 | 1344 | 1260 | 1176 | 1092 | 1008 |  | 29.08 | 28.8222 |  |  |  |  |  |  |  |  |  | 1 |
| 42 |  |  |  |  |  |  |  |  | 8020 | 29.793 | 92 |  |  |  |  |  |  |  |  |  |  |
| 43 | 582 | 573 |  | 55 | 5468 |  | 5292 |  |  | $30 \cdot 502$ | $30 \cdot$ | 237 |  |  | 2637 | 2726 | 2815 | 2904 | 2993 | 308 | 43 |
| 44 | 2932 |  |  | 2662 |  |  |  | 2301 | 2211 | 31.2121 | 30．9312 | 940 |  | 9585 | 967 |  |  |  | H39 | 013 | 44 |
| 45 | － 044 | 995 |  |  |  |  |  |  |  | 1 | $31 \cdot 6$ | 643 | 65 | 6621 | 671 |  |  |  |  |  | 45 |
| 46 | 7156 | 7062 | 6968 | 687 |  |  |  | 6497 |  | 32 | $32 \cdot 337$ |  |  |  |  |  |  |  |  |  | 46 |
| 47 | 428 |  | 40 |  | 3883 |  |  | 3595 |  | 33 | 33 |  |  |  |  | 0887 |  |  |  |  |  |
| 48 |  |  | 1184 |  |  |  |  |  | 0594 | 34 | 33 |  |  | 7729 | 78 | 792 |  |  |  |  | 48 |
| 49 | 849 | 8392 | 829 |  |  |  |  |  |  |  | 34 |  |  | 4765 | 486 |  |  |  | 5271 | 537 | 49 |
| 50 | 5604 | 5502 | 5400 | 529 | 5195 | 5093 | 4990 | 4888 | 4785 | 35 | 35 | 1594 | 1697 | 1801 | 1904 | 2007 | 2111 | 2214 | 2317 | 242 | 50 |
| 51 | 2716 |  | 2508 |  |  |  |  |  |  |  | $35 \cdot 8520$ |  |  |  |  |  |  |  |  |  |  |
| 5 | 98 |  | 9616 | 9509 |  |  |  | 9083 | 897 | －88 | $36 \cdot 5$ |  |  |  |  |  |  |  |  |  |  |
| 53 | 69 |  | 6724 | 66 |  | 6398 |  |  | 672 | －59 | 37 |  |  |  | 3018 | 3128 | 3237 | 3347 | 456 | 356 |  |
|  | 40 |  | 3832 | 3721 |  |  |  | 3279 | 3168 | 38.305 | 37 |  |  | 945 | ． 05 |  | 028 | 039 | 0502 | 061 | 5 |
| 55 | 1 | 1052 | 0940 | 0827 | 0715 | 060 |  | 0377 |  | 39.0151 | 38 | 67 | 6867 | 6981 |  |  |  |  |  |  | 55 |
| 56 | 82 | 8162 | 8048 |  |  |  |  |  |  | $130 \cdot 7245$ |  |  |  |  |  |  |  |  |  |  | 56 |
| 57 | 53 |  |  |  |  |  |  |  | 4455 | 43 | 40.0 |  |  |  |  |  |  |  |  |  |  |
| 58 | 25 |  |  | 2145 | 2026 |  |  | 1670 | 1551 | $1 \cdot 1$ | 40.7 |  |  |  |  |  |  |  |  |  | 58 |
| 59 | 96 |  |  |  |  |  |  |  |  | $41 \cdot 8$ | $41^{\circ} 4$ |  |  |  | 524 |  | 54 |  | 5734 | 585 | 59 |
| 60 | 6725 | 6602 | 6480 | 6357 | 6234 | 6111 | 5988 | 5865 | 5742 | 42.5 | 42. | 1913 |  | 2161 | 228 | 240 | 2533 | 2657 | 278 | 290 | 60 |
| 61 | 3837 |  |  |  |  |  |  | 2963 | 2838 | 43.27 |  |  |  |  |  |  |  |  |  |  | 6 |
| 62 | 09 |  |  |  |  | 0315 | 0188 | ＋061 | 993 | 43.98 | 43.5 |  |  |  |  |  |  | 6745 |  |  |  |
| 63 | 806 |  |  |  |  |  | 7288 |  |  | $44 \cdot 69$ | 44.28 |  |  |  | 3399 |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 88 |  | 412 | $5 \cdot 3$ | 44. |  | 017 | 03 | 043 |  |  |  |  |  | 64 |
| 65 | 2286 | 215 | 202 | 188 | 1754 |  | 1487 |  | 122 | $46 \cdot 1$ | 45.693 | 707 | 7207 | 7341 | 7475 |  |  |  |  | 8146 | 65 |
| 66 | 939 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 66 |
| 67 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5951 | ， | 1828 | 1967 | 10 | 224 |  |
| 68 | 362 |  |  |  | 3065 | 2926 | 2787 | 2647 | 250 | 48.236 | $47 \cdot 802$ |  |  | 84 | 859 | 87 | 881 | 901 | ， | 929 |  |
| 69 | 07 |  | 045 |  |  |  | 9887 | 9745 |  | 48.94 | 48.50 |  |  | 5483 | 62 | 年 |  |  |  |  |  |
| 70 | 78 |  |  |  |  |  |  |  |  | $49 \cdot 65$ | 49.20 |  | 2376 | 252 |  | 29 | 295 |  |  |  | 70 |
| 71 |  |  |  |  |  |  |  |  |  | 50．3650 |  |  |  |  |  |  |  |  |  |  |  |
| 7 | 20 | 1923 | 177 | 162 |  | 1333 | 1186 | 1039 | 089 | 51.07 | $50 \cdot 61$ |  | 64 | 6593 | 674 | 689 | 703 | 楮 | 33 | 748 | 72 |
| 73 | 9182 |  |  |  |  |  |  | d |  | －7831 |  |  |  | 629 | 378 | 393 | 40 | 4232 | 4383 | 453 | 73 |
| 74 |  | ¢ |  |  |  | 5537 | 886 | 5234 | 082 | 52.4931 | 52.0206 | 035 | 0512 | 0665 | 081 | 09 | 11 | 127 | 14 | 158 | 74 |
| 75 | 3406 | 3253 | 310 | 2946 | 2793 | 2639 | 2485 | 2332 | 2178 | 53．2024 | 52．723 | 73 | 7546 | 7701 | 785 | 801 |  |  |  |  | 75 |
| 76 | 05 | 0363 | 0208 |  |  | 9741 |  | 43 | 9274 |  |  |  |  |  |  |  |  |  |  |  |  |
| 77 |  |  |  |  |  |  |  |  |  |  |  |  |  | 1773 | 矿 | 201 | 2250 | 2409 |  | 2727 |  |
| 78 | 4743 | 4583 | 442 | 426 | 4104 | 45 | 3785 | 362 | 346 | 55.33 | 54．832 | 84 | 86 | 8809 | 8970 | 913 | 9293 | 9454 | 析 | 977 |  |
| 79 | 1855 |  |  | 硣 |  | d | 885 | ， |  |  |  | 5 | 62 | 885 | 680 | 617 | 6335 | 6498 | 6661 | 682 |  |
| 80 | 89 |  |  | 8476 | 8312 | 48 | 84 | 7821 | 7657 | 56.749 | 23 | 2550 | 2716 | 288 | 304 | 321 | 337 | 35. | 37 | 387 | 80 |
| 81 | 607 |  |  |  |  | 5250 | ｜ 5084 | 4918 | 4752 | \％ 48 | 56 | 95 | 9750 | 9917 | ．08 | 025 | 04 | 0587 | 75 |  |  |
| 82 | 319 | 302 | 2856 | 2688 | 2520 | 2352 | 2184 | 2016 | 184 | 58.168 | 57.6 | 66 | 6784 | 6953 | 712 | 72 | 746 | 678 | 880 | 796 |  |
| 83 | O30 | －133 |  |  |  |  | 9284 | ， | 844 | ．87 |  |  | 3818 | 3989 | 416 | 438 | 450 | 471 | 84 | 501 | 83 |
| 84 | 7415 | 7243 | 707 | 6900 | 67 | 6556 | 6384 | 621 | 603 | 59.586 | 59.05 | 06 | 085 | 1025 | 119 | 1372 | 1546 | 17 | 1893 |  | 84 |
| 85 | 4527 | 4353 | 4180 |  |  |  |  |  |  |  | 59 | 7710 | 7885 | 8061 |  | 8412 |  |  |  | 911 |  |
| 86 | 163 | 1464 | 1288 |  |  |  |  |  |  |  |  |  |  |  | 2313 | 兂 | 析 |  | 5985 | 6163 |  |
| 87 | 8751 | 8 | 8396 | 8217 | 8039 |  | 7683 | 7505 | 7327 | 61714 | $61 \cdot 15$ | 17 | 19 | 213 | 231 | 24 | 267 | 285 | 303 |  |  |
| 88 | 5864 | 568 | 55 | 5323 | 43 | 4963 | 4783 | 4603 | 22 | 62.424 | 61.8 |  | 898 | 9169 | 935 | 953 | 975 | 989 | 1217 | 026 |  |
| 89 |  |  |  |  | 1 |  | 矿 | 1700 | 1518 | $63 \cdot 133$ | 62.5653 | 883 | 6021 | 620 | 638 | 656 | 6757 |  |  |  |  |
| 90 | －088 | 204 | 9720 | 9535 | 9351 | 67 | 983 | 8798 | 8614 | $63 \cdot 8429$ | 63.2683 | 286 | 3055 | 324 | 342 | 3613 | 379 | 398 | 4171 | 435 | 90 |
| 91 | 720 | 7014 | 682 | 6641 | 6455 | 6269 | 6082 | 5896 | 5709 | 4.55 | 63.97 | 9901 | ＋089 | 027 | 0465 | 06 | 0841 | 1029 | 1217 |  | 91 |
| 92 | 4312 | 4124 | 9936 | ， | 3559 | 3371 | 3182 | 2994 | 2805 | ． 261 | 64.6743 | 6933 | 1123 | 7313 | 7503 | 7694 | 888 | 810 | 8263 | 5453 |  |
|  | 142 | 123 | 1044 |  |  | 472 | 0282 | －09 | 9901 | $65 \cdot 97$ | $65 \cdot 3772$ | 3965 | 4157 | 4349 | 454 | 4734 | 492 | 5118 | 531 | 550 | 93 |
| 9. | 853 | 834 | 8152 | 7959 | 7767 | 74 | 7382 |  |  | $66^{\circ} 68$ | 66 | 097 | 19 | 138 | 158 | 177 | 968 | 2162 | 2356 | 25 | 94 |
| 95 | 56 | 5454 |  |  |  |  |  |  |  | 67－389 |  |  | 8225 | 342 | 861 | 881 | 9010 | 9206 | 9402 |  | 95 |
|  |  |  |  |  |  |  |  | 1385 |  |  | 6748 | ， | 5259 | 545 | 65 | 585 |  |  | 6449 | 664 | 96 |
| 97 | 9872 | 967 | 947 | 927 | 9078 | 8880 |  | 848 | 828 | 68：80 | 68 | 209 | 2293 | 2493 | 269 | 289 | 301 | 3295 | 349 | 69 |  |
| 9 | 6984 | 6784 | 5 |  | 82 | 92 | 硣 | 5580 | 239 | 517 | 68891 |  | 9327 | 952 | 9732 | 9934 | 113 | 03 | 0542 | 074 | 98 |
|  | 9 |  |  |  |  |  | 2881 | 2678 | 247 | 70.227 | $69 \cdot 595$ | 61 | 636 | 656 | 677 | 6975 | 7179 | 7384 | 7588 | 779 | 99 |
| 100 | 1209 | 1004 | 0800 | 0595 | 0390 | 185 | 9981 | 9776 | 9571 | 70.936 | 70.2981 | 3188 | 339 | 360 | 380 | 4015 | 422 | 4428 | 4634 | 4841 | 100 |
|  | $20^{\prime}$ | 19 | $18^{\prime}$ | $17^{\prime}$ | $16^{\prime}$ | $15^{\prime}$ | ｜ $14^{\prime}$ | $13^{\prime}$ | $\mid 12^{\prime}$ |  | $20^{\prime}$ |  |  |  | $\mid 16^{\prime \prime}$ | $\left\|15^{\prime}\right\|$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | INE． |  |  |  |  |  |

TRAVERSE TABLES

| 44 | Cosine． |  |  |  |  |  |  |  |  |  |  | Sine． |  |  |  |  |  |  |  |  |  |  | $44^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 50＇ | 51 | 52 | 53＇ | 54 | $55^{\prime}$ | 56 | 57 | 58＇ | 59 | $60^{\prime}$ | 50 | 51 | 52 | $53^{\prime}$ | $54^{\prime}$ | 55 | 56 | 57 | $58^{\prime}$ | $59^{\prime}$ |  |  |
|  | 7092 | 70 | 70 | 70 | 708 | 708 | 70 | 70 | 70 | 70 | 707 | 50 | 7053 | 7055 | 70 | 7059 | 7061 | 7063 | 7065 | 7067 | 9099 | 7071 |  |
|  | 4183 | 4179 | 4175 | 417 | 4167 | ${ }_{4} 163$ | 4159 | 415 | 415 | 414 | 1.414 | $1 \cdot 410$ | 4105 | 4109 | 4113 | 4117 | 412 | 412 | 413 | 4134 | 4138 | 4142 |  |
|  | 1275 | 1269 | 1263 | 1256 | 1250 | 1244 | 1238 | 1232 | 1226 | 1219 | $2 \cdot 1213$ |  | 1158 | 1164 | 1170 | 1176 | 1182 | 118 | 1195 | 1201 | 1207 | 1213 |  |
|  | 8366 | 8358 | 8350 | 834 | 8334 | 8325 | 8317 | 830 | 830 | 8292 | $2 \cdot 828$ | 2．8202 | 8210 | 8218 | 8227 | 8235 | 8243 | 825 | 8260 | 8268 | 8276 | 8284 |  |
| 5 | 5458 | 5448 | 5438 | 5427 | 5417 | 407 | 539 | ｜ 5386 | 5376 | 5366 | 3.5355 | 252 | 5263 | 5273 | 5283 | 5294 | 5304 | 5314 | 5324 | 5335 | 5345 | 535 |  |
| 6 | 2550 | 253 | 2525 | 2513 | 250 | 2488 | 24 | 24 | 24 | 2439 | 4.2 | 4.23 | 23 | 2328 | 2340 | 2352 | 236 | 2377 | 238 | 2402 | 2414 | 2426 |  |
|  | 9641 | 9627 | 9613 | 9598 | 9584 | 9569 | 9555 | 9541 | 9526 | 9512 | 4.949 | 4.9353 | 9368 | 9382 | 9397 | 9411 | 9425 | 9440 | 945 | 9469 | 9483 | 9497 |  |
|  | 6733 | 6716 | 6700 | 6684 | 6667 | 6651 | 6634 | 6618 | 6601 | 658 | $5 \cdot 656$ | 5.6404 | 6420 | 6437 | 6453 | 6470 | 648 | 650 | 651 | 6536 | 6552 | 6569 |  |
|  | 3824 | 380 | 3788 | 376 | 3751 | 3732 | 3714 | 3695 | 3677 | 3658 | 6．3640 | 6．3454 | 3473 | 3491 | 3510 | 3528 | 354 | 3566 | 3584 | 3603 | 362！ | 3640 |  |
| 10 | 0916 | 0896 | 0875 | 0855 | 0834 | 0813 | 0793 | 0772 | 0752 | 0731 | $7 \cdot 0711$ | 7.0505 | 0525 | 0546 | 0567 | 05 | 0608 | 062 | 06 |  | 0 | 0711 | $\underline{10}$ |
| 11 | 800 | 79 | 79 | 79 | 79 | 7895 | 78 | 78 | 78 | 78 | $7 \cdot 7782$ | 7.7555 | 7578 | 7601 | 7623 | 7646 | 9 | 7691 | 4 |  | 108 | 7782 | 11 |
| 12 | 509 | 507 | 5050 | 502 | 5001 | 4976 | 4951 | 4927 | 4902 | 4877 | 8.4853 | 8.4606 | 4630 | 4655 | 4680 | 4705 | 4729 | 4754 | 4779 | 4803 | 4828 | 4853 | 12 |
| 13 | 2191 | 2164 | 2138 | 2111 | 2084 | 2057 | 2031 | 2004 | 1977 | 1951 | 9．1924 | ． 1656 | 1683 | 1710 | 1737 | 1763 | 1790 | 1817 | 1844 | 1870 | 1897 | 1924 | 13 |
| 14 | 9282 | 9254 | 9225 | 9196 | 9168 | 9139 | 9110 | 9081 | 9053 | 9024 | 899 | 870 | 8735 | 8764 | 8793 | 8822 | 885 | 888 | 890 | 8937 | 8966 | 899 | 14 |
| 15 | 6374 | 6343 | 6313 | 6282 | 6251 | 6220 | 6189 | 6159 | 6128 | 6097 | $10 \cdot 6066$ | 10.5757 | 5788 | 5819 | 5850 | 5881 | 5912 | 5943 | 5973 | 6004 | 6035 | 606 | 15 |
| 16 | 3466 | 3433 | 3400 | 3367 | 3334 | 3302 | 3269 | 36 | 3203 | 3170 | 11.3137 | 11.2808 | 2841 | 2874 | 2906 | 2939 | 2972 | 3005 | 3038 | 3071 | 3104 | 3137 | 16 |
| 17 | 0557 | 0522 | 0488 | 0453 | 0418 | 0383 | 0348 | 0313 | 0278 | 0243 | 12.0208 | 11.985 | 9893 | 9928 | 9963 | 9998 | －033 | 00 |  | 0138 | 0173 | 0208 | 17 |
| 18 | 7649 | 7612 | 7575 | 7538 | 750 | 7464 | 7427 | 7390 | 7353 | 7316 | 12.7279 | 12.6908 | 6946 | 6983 | 7020 | 7057 | 7094 | 713 | 716 | 720 | 7242 | 7279 | 18 |
| 19 | 4741 | 4702 | 4663 | 4624 | 4585 | 4546 | 4507 | 4467 | 4428 | 4389 | 13.4350 | 13.3959 | 3998 | 4037 | 4076 | 4116 | 4155 | 4194 | 4233 | 4272 | 4311 | 4350 | 19 |
| 20 | 183 | 1791 | 1750 | 170 | 985 | 1627 | 1586 | 545 | 504 | 1462 | 14.1421 | 14.1009 | 1051 | 1092 | 1133 | 1174 | 1216 | 1257 | 1298 | 1339 | 1380 | 142 | 2 |
| 21 | 892 | 8881 | 8838 | 87 | 87 | 87 | 8665 | 8622 | 85 | 85 | 14. | 14•8060 | 810 | 814 | 81 | 823 | 827 | 832 | 83 | 84 | 8449 | 8492 | 21 |
| 22 | 6015 | 5970 | 5925 | 58 | 583 | 5790 | 5744 | 5699 | 5654 | 560 | 15.55 | 15.5110 | 5156 | 5201 | 52 | 5292 | 5337 | 538 | 542 | 5473 | 5518 | 55 | 22 |
| 23 | 3107 | 3060 | 3013 | 2965 | 2918 | 2871 | 2824 | 2776 | 2729 | 2682 | 16.2635 | 16.2161 | 2208 | 2256 | 2303 | 2350 | 2398 | 2445 | 24 | 2540 | 2587 | 2635 | 23 |
| 24 | 0199 | 0149 | 0100 | 0051 | ＋002 | 9952 | 9903 | 9854 | 9804 | 9755 | 16.9706 | 16.9211 | 9261 | 9310 | 9360 | 94 | 9459 | 950 | 955 | 960 | 9656 | 9706 | 24 |
| 25 | 7290 | 7239 | 7188 | 7136 | 85 | 7034 | 82 | 31， | 6880 | 6828 | $17 \cdot 6777$ | $17 \cdot 6262$ | 6313 | 6365 | 6416 | 6463 | 6519 | 6571 | 6622 | 6674 | 6725 | 6777 | 25 |
| 26 | 438 | 43 | 4275 | 4222 | 4168 | 4115 | 4062 | 4008 | 3955 | 3901 | 18.3848 | $18 \cdot 3312$ | 3366 | 3419 | 3473 | 3527 | 358 | 3634 | 368 | 37 | 3794 | 888 | 26 |
| 27 | 1473 | 1418 | 1363 | 1307 | 1252 | ， | 114 | 1085 | 1030 | 0974 | 19.0919 | 19.0363 | 0418 | 047 | 0530 | 0585 | 0641 | 0697 | 075 | 0808 | 0863 | 0919 | 27 |
| 28 | 8565 | 8508 | 8450 | 839 | 8335 | 8278 | 20 | 163 | 8105 | 8047 | 19.7990 | 19.7413 | 7471 | 7529 | 7586 | 7644 | 7702 | 7759 | 781 | 787 | 793 | 799 | 28 |
| 29 | 5657 | 5597 | 5538 | 5478 | 5419 | 5359 | 5299 | 5240 | 5180 | 5121 | 20．5061 | 20.4464 | 4523 | 4583 | 4643 | 4703 | 4763 | 482 | 488 | 4942 | 5001 | 506 | 29 |
| 30 | 2748 | 2687 | 2625 | 2564 | 2502 | 2440 | 2379 | 2317 | 2255 | 2194 | 21：2132 | $21 \cdot 1514$ | 1576 | 1638 | 1700 | 1761 | 182 | 188 | 1947 | 200 | 2070 | 2132 | 30 |
| 31 | 9840 | 1977 | 9713 | 964 | 958 | 95 | 9458 | 394 | 933 | 92 | 21 | 21.856 | 862 | 8692 | 875 | 82 | 8884 | 8948 | 9012 | 9076 | 9139 | 9203 | 31 |
| 32 | 693 | 686 | 68 | 673 | 6669 | 66 | 537 | 472 | 6406 | 6340 | 22．627 | $22 \cdot 5615$ | 5681 | 5747 | 5813 | 587 | 5945 | 601 | 607 | 614 | 62 | 627 | 32 |
| 33 | 4023 | 1955 | 3888 | 3820 | 3752 | 3684 | 3617 | 354 | 3481 | 3413 | 23.334 | 23.266 | 2734 | 2802 | 2870 | 293 | 300 | 307 | 314 | 320 | 3277 | 334 | 33 |
| 34 | 1115 | 1045 | 0975 | 0905 | 0836 | 0766 | 069 | 626 | 0556 | 0486 | 24.0416 | 23.9716 | 9786 | 9856 | 9926 | 999 | －066 | 013 | 020 | 027 | 0346 | 04 | 34 |
| 35 | 8206 | 81 | 80 | 79 | 79 | 78 | 75 | 7703 | 31 | 7559 | 24.748 | 24 | 839 | 6911 | 6983 | 055 | 127 | 719 | 27 | 7343 | 7415 | 7487 | 35 |
| 36 | 52 | 5224 | 5150 | 5076 | 5002 | 492 | 4854 | 4780 | 06 | 4632 | 25 | 25.3817 | 3891 | 396 | 4040 | 4114 | 4188 | 42 | 433 | 441 | 4484 | 558 | 36 |
| 37 | 2389 | 2314 | 2238 | 21 | 2086 | 2010 | 1934 | 58 | 782 | 1706 | 26．1630 | $26^{\circ}$ | 09 | 102 | 109 | 1172 | 1249 | 1325 | 140 | 147 | 1553 | 1630 | 37 |
| 38 | 9481 | 9403 | 9325 | 92 | 9169 | 9091 | 9013 | 35 | 857 | 8779 | ＇26．8701 | $26 \cdot 7918$ | 7996 | 8075 | 8153 | 8231 | 8309 | 838 | 846 | 85 | 8622 | 870 | 38 |
| 39 | 6573 | 6493 | 6413 | 333 | 253 | 6172 | 6092 | 6012 | 932 | 5852 | $27 \cdot 5772$ | 27.4968 | 5049 | 5129 | 5210 | 5290 | 5370 | 545 | 553 | 561 | 5691 | 5772 | 39 |
| 40 | 3664 | 3582 | 3500 | 3418 | 3336 | 3254 | 3172 | 3089 | 007 | 2925 | 28.2843 | 28.2019 | 2101 | 2184 | 2266 | 2349 | 2431 | 2513 | 259 | 267 | 2760 | 2843 | 40 |
| 41 | 075 | 067 | 0588 | 0503 | 0419 | 0335 | 0251 | 0167 | ${ }^{+082}$ | 9998 | 28.9914 | 28.9069 | 9154 | 9238 | 9323 | 9407 | 9492 | 957 | 9661 | 9745 | 9829 | 9914 | 41 |
| 42 | 784 | 776 | 7675 | 7589 | 7503 | 7416 | 7330 | 44 | 58 | 7071 | 29.6985 | 29 | 6206 | 6293 | 6380 | 6466 | 6553 | 6639 | 6726 | 681 | 689 | 698 | 42 |
| 43 | 493 | 4851 | 4763 | 4674 | 4586 | 4498 | 4410 | 4321 | 4233 | 4144 | 30.4056 | 30．317 | 3259 | 3348 | 3436 | 3525 | 3613 | 3702 | 3790 | 387 | 39 | 405 | 43 |
| 44 | 203 | 1940 | 1850 | 1760 | 16 | 1579 | 1489 | 1398 | 1308 | 1217 | $31 \cdot 1127$ | 31.0221 | 0311 | 0402 | 0493 | 0584 | 0674 | 0765 | 0855 | 094 | 1036 | 11 | 44 |
| 45 | 9122 | 9030 | 8938 | 8845 | 8753 | 8661 | 8568 | 76 | 8383 | 291 | 31．8198 | 31.727 | 364 | 457 | 7549 | 64 | 773 | 782 | 792 | 8013 | 8105 | 819 | 45 |
| 46 | 6214 | 6120 | 6025 | 5931 | 5836 | 5742 | 5647 | 553 | 458 | 5364 | 32.5269 | 32．432 | 4416 | 4511 | 4606 | 4701 | 4796 | 4890 | 498 | 508 | 5175 | 5269 | 46 |
| 47 | 3306 | 3209 | 3113 | 3016 | 292 | 2823 | 2727 | 2630 | 2533 | 2437 | 33．2340 | 33 | 1469 | 1566 | 1663 | 1760 | 1856 | 1953 | 2050 | 214 | 2244 | 2340 | 47 |
| 48 | 0397 | 0299 | 02 | 0102 | －003 | 9905 | 9806 | 9707 | 9609 | 9510 | 33.9411 | 33.8423 | 8522 | 8621 | 8719 | 8818 | 8917 | 9016 | 9115 | 921 | 9313 |  | 48 |
| 49 | 7489 | 7388 | 7288 | 7187 | 7087 | 6986 | 6885 | 6785 | 6684 | 6583 | 34．6482 | 34.5473 | 5574 | 5675 | 5776 | 5877 | 5978 | 6079 | 6180 | 618 | 638 | 64 | 19 |
| 50 | 4580 | 4478 | 4375 | 4273 | 4170 | 4067 | 3965 | 3862 | 3759 | 3656 | 35.3553 | 35．2523 | 2627 | 2730 | 2833 | 2936 | 3039 | 3142 | 3245 | 334 | 34 | 3553 | 50 |
| 51 | 1672 | 15 | 1463 | 1358 | 1253 | 11 | 1044 | 0939 | 0834 | 0729 | 36 | 35．9574 | 9679 | 9784 | 88 | 99 | 1100 | 0205 | 0310 | 0415 | 0520 | 0624 | 51 |
|  | 876 | 86 | 8550 | 43 | 8337 | 8230 | 8123 | 8016 | 909 | 802 | 36.7696 | 36.6624 | 6732 | 6839 | 6946 | 7053 | 7160 | 7267 | 7374 | 748 | 758 | 7696 | 52 |
| 53 | 5855 | 5746 | 5638 | 5529 | 5420 | 5311 | 5202 | 5094 | 4985 | 4876 | 37－4767 | $37 \cdot 3675$ | 378 | 3893 | 4003 | 411 | 4221 | 4330 | 4439 | 454 | 465 | 4767 | 53 |
| 54 | 2947 | 2836 | 2725 | 2614 | 2503 | 2393 | 2282 | 2171 | 2060 | 1949 | 38．1838 | 38.0725 | 0837 | 0948 | 1059 | 1171 | 1282 | 1393 | 1504 | 161 | 172 | 1838 | 54 |
| 55 | －03 | 9926 | 9813 | 9700 | 9587 | 9474 | 9361 | 48 | 9135 | 22 | 38 | $38 \cdot 777$ | 88 | 8003 | 8116 | 8229 | 8343 | 8456 | 8569 | 868 | 879 | 3909 | 55 |
| 56 | 7130 | 7015 | 6900 | 85 | 70 | 555 | 6440 | 6325 | 6210 | 6095 | 39－5980 | 39.4826 | 4942 | 5057 | 5173 | 5288 | 5403 | 5519 | 5634 | 5749 | 5865 | 598 | 56 |
| 57 | 4222 | 4105 | 39 | 38 | 37 | 363 | 3520 | 3402 | 3285 | 3168 | 40.3051 | 40. | 1994 | 2112 | 2229 | 2347 | 2464 | 2582 | 2699 | 2816 | 2934 | 305 | 57 |
| 58 | 1313 | 1194 | 1075 | 0956 | 0837 | 0718 | 0599 | 80 | 360 | 0241 | 41.0122 | 40．8927 | 9047 | 9166 | 9286 | 9406 | 9525 | 9644 | 9764 | 988 | 1003 | 012 | 58 |
| 59 | 8405 | 8284 | 8163 | 8042 | 7920 | 779 | 7678 | 755 | 7436 | 7314 | 41.7193 | 41.59 | 609 | 622 | 6343 | 6464 | 6586 | 6707 | 6829 | 695 | 7072 |  | 59 |
| 60 | 5496 | 5373 | 5250 | 5127 | 5004 | 4881 | 4757 | 4634 | 4511 | 4387 | 42.4264 | $42 \cdot 3028$ | 3152 | 3276 | 3399 | 3523 | 3647 | 3770 | 389 | 40 | 414 | 4264 | 60 |
| 61 | 25 | 24 | 2338 | 2213 | 2087 | 1962 |  | 1711 | 1586 | 1461 | 43 | $43^{*} 0079$ | 0204 | 0330 | 045 | 058 | 0707 | 083 | 0959 | 1084 | 121 | 133 | 61 |
| 62 | 9680 | 9552 | 9425 | 92 | 71 | 9043 | 8916 | 8789 | 8661 | 534 | 43.8406 | 43.7129 | 7257 | 7385 | 7513 | 7640 | 7768 | 7896 | 8023 | 8151 | 8279 | 8406 | 62 |
| 63 | 6771 | 6642 | 6513 | 63 | 6254 | 6125 | 599 | 5866 | 5736 | 5607 | 44.5477 | 44.4180 | 4310 | 4439 | 456 | 469 | 4829 | 4959 | 5088 | 5218 | 5 | 5477 | 63 |
| 64 | 3863 | 3732 | 3600 |  | 3337 | 32 | 307 | 2943 | 2812 | 2680 | 45.2548 | $45 \cdot 1230$ | 1362 | 1494 | 1626 | 1758 | 1890 | 2021 | 2153 | 2285 | 24 | 254 | 6 |
| 65 | 095 | 0821 | 0688 | 05 | 21 | 0287 | 0154 | －020 | 9887 | 9753 | 45.9619 | 45.8280 | 841 | 85 | 868 | 88 | 8950 | 9084 | 92 | 9352 | 9486 | 9619 | 65 |
| 66 | 80 | 79 | 77 |  | 504 | 7369 | 7233 | 7098 | 6962 | 6826 | 46.6690 | 46.5331 | 5467 | 5603 | 5739 | 5875 | 6011 | 6147 | 6283 | 6419 | 655 |  | 66 |
| 67 | 513 | 5000 | 48 | 47 | 4588 | 4450 | 4312 | 4175 | 4037 | 3899 | 47.3762 | $47 \cdot 238$ | 2520 | 2658 | 2796 | 2934 | 3072 | 2217 | 析 | 5553 |  | 矿 | 67 |
| 68 | 2229 | 20 |  |  | 1671 | 1531 | 1392 | 1252 | 1112 | 0972 | $48^{\circ} 0833$ | $47 \cdot 943$ | 9572 | 9712 | 9853 | 9993 | －133 | 0273 | 0413 | 0553 | 0693 | 083 | 68 |
| 69 | 9321 | 9179 | 38 | 8896 | 8754 | 矿 | 8471 | 8329 | 8187 | 8046 | $48^{\circ} 7904$ | 48.6482 | 6625 | 6767 | 6909 | 7051 | 7194 | 733 | 7478 | 762 | 776 |  | 69 |
| 70 | 6412 | 6269 | 6125 | ， | 5838 | 5694 | 5550 | 5407 | 5263 | 5119 | $49 \cdot 4975$ | 49.3533 | 3677 | 3822 | 3966 | 4110 | 425 | 4398 | 454 | 468 | 483 | 497 | 70 |
| 71 | 350 | 33 | 3213 | － | 2921 | 2775 | 2630 | 2484 | 2338 | 19 | 50．2046 | 50．058 | 0730 | 0876 | 1023 | 116 | 1315 | 1461 | 1607 | 75 | 1900 |  | 71 |
| 72 | 059 | 0448 | 0300 | 0152 | －005 | 9857 | 9709 | 9561 | 9413 | 9265 | 50.9117 | $50 \cdot 7634$ | 7782 | 7931 | 8079 | 8228 | 8376 | 8524 | 8672 | 8821 | 8969 | 917 | 72 |
| 73 | 7687 | 7538 | 7388 | 7238 | 7088 | 6938 | 6788 | 6638 | 6488 | 6338 | 51.6188 | 51．4684 | 4835 | 4985 | 5136 | 5286 | 5437 | 5587 | 5737 | 5888 | 6038 | 617 | 73 |
| 74 | 4779 | 4627 | 4475 | 4323 | 4171 | 4020 | 3868 | 3715 | 3563 | 3411 | 52.3259 | 52．1735 | 1887 | 2040 | 2192 | 2345 | 2497 | 2650 | 2802 | 2955 | 3107 | 3259 | 75 |
| 75 | 1871 | 1717 | 1563 | 1409 | 1255 | 110 | 0947 | 0793 | 0639 | 0484 | 53.0330 | 52.8785 | 894 | 909 | 92 | 9404 | 95 | 97 | 9867 | －021 | 017 | 0330 | 75 |
| 76 | 8962 | 8806 | 8650 | 8494 | 8338 | 8182 | 8026 | 7870 | 7714 | 7557 | $53 \cdot 7401$ | 53.5836 | 5992 | 6149 | 6306 | 6462 | 6619 | 6775 | 6932 | 7088 | 7245 |  | 77 |
| 77 | 6054 | 5896 | 5738 | 5580 | 5422 | 5264 | 5105 | 4947 | 4789 | 4631 | 54．4472 | 54.2886 | 3045 | 3204 | 3362 | 3521 | 3680 | 3838 | 3997 | 4155 | 4314 | 447 | 78 |
| 78 | 3145 | 2985 | 2825 | 2665 | 2505 | 2345 | 2185 | 2024 | 1864 | 1704 | 55．1543 | 54.9937 | －097 | 0258 | 0419 | 0580 | 0741 | 0901 | 1062 | 1222 | 1383 | 15 | 78 |
| 79 | 0237 | －075 | 9913 | 9751 | 9588 | 9426 | 9264 | 9102 | 8939 | 8777 | 55．8614 | 55.6987 | 7150 | 7313 | 7476 | 7639 | 7801 | 7964 | 8127 | 8289 | 8452 | d614 | 79 |
| 80 | 7329 | 7164 | 7000 | 6836 | 6672 | 6508 | 6343 | 6179 | 6014 | 5850 | 56.5685 | 56．4038 | 4203 | 4368 | 4532 | 4697 | 4862 | 5027 | 5192 | 535 | 552 | 568 | 80 |
| 81 | 4420 | 4254 | 4088 | 102 | 3755 | 3589 | 3423 | 3256 | 3090 | 2923 | 57.2757 | 57．1088 | 1255 | 1422 | 1589 | 1756 | 1923 | 2090 | 225 | 242 | 2590 | 27 |  |
| 82 | 1512 | 1344 | 1175 | 100 | 0839 | 0670 | 0502 | 0333 | －165 | 9996 | 57.9828 | $57 \cdot 8138$ | 8308 | 8477 | 8646 | 8815 | 8984 | 9152 | 9321 | 9490 | 9659 | 9828 | 82 |
| 83 | 8603 | 8433 | 8263 | 8092 | 7922 | 7752 | 7581 | 7411 | 7240 | 7069 | 58.6899 | 58.5189 | 5360 | 5531 | 5702 | 5873 | 6044 | 6215 | 6386 | 6557 | 6728 | 6897 |  |
| 84 | 5695 | 5523 | 5350 | 5178 | 5005 | 4833 | 4660 | 4488 | 4315 | 4142 | 59.3970 | 59.2239 | 2413 | 2586 | 2759 | 2932 | 3105 | 3278 | 3451 | 3624 | 3797 | 3970 | 84 |
| 85 | 2787 | 2612 | 243 | 2263 | 2089 | 1914 | 1740 | 1565 | 1390 | 1216 | 60．1041 | 59.9290 | 9465 | 964 | 9816 | 9991 | ＋166 | 34 | 0516 | 0691 | 0866 | 10 | 9 |
| 86 | 9878 | 9702 | 9525 | 9349 | 9172 | 8996 | 8819 | 18642 | 8465 | 8289 | $60 \cdot 8112$ | 60.6340 | 6518 | 6695 | 6872 | 7050 | 7227 | 7404 | 758 | 7758 | 7935 | 81 | \％ |
| 87 | 6970 | 6791 | 661 | 6434 | 6256 | 6077 | 5898 | 5720 | 5541 | 5362 | 61.5183 | 61.3391 | 3570 | 3750 | 3929 | 4108 | 4288 | 4467 | 4646 | 4825 | 5004 | 518 | 87 |
| 88 | 4061 | 3881 | 3700 | 3520 | 3339 | 3158 | 2978 | 2797 | 2616 | 2435 | $62 \cdot 2254$ | $62^{.0441}$ | 0623 | 0804 | 0986 | 1167 | 1348 | 1529 | 1711 | 1892 | 2073 | 2254 | 88 |
| 89 | 1153 | 0970 | 6788 | 0605 | 0422 | 0240 | ＋057 | 9874 | 9691 | 9508 | 62.9325 | 62.7492 | 7675 | 7859 | 8042 | 8226 | 8409 | 8592 | 8776 | 8959 | 9142 | 932 | 89 |
| 90 | 8245 | 8060 | 7875 | 7691 | 7506 | 7321 | 7136 | 6951 | 6766 | 6581 | 63.6396 | 63.4542 | 4728 | 4913 | 5099 | 5284 | 5470 | 565 | 5840 | 6026 | 621 | 6396 | 90 |
| 91 | 5336 | 5150 | 4963 | 4776 | 4589 | 4402 | 4215 | 4028 | 3841 | 3654 | 64．3467 | 64．1593 | 1780 | 1968 | 2156 | 2343 | 2531 | 2718 | 2905 | 3093 | 3280 | 5 | 91 |
| 92 | 2428 | 2239 | 2050 | 1861 | 1673 | 1484 | 1295 | 1106 | 0917 | 0727 | 65.0538 | 64.8643 | 8833 | 9023 | 9212 | 9402 | 9591 | 9781 | 9970 | －160 | 0349 | 053 | 92 |
| 93 | 9519 | 9329 | 9138 | 8947 | 8756 | 8565 | 8374 | 8183 | 7992 | 7801 | $65 \cdot 7609$ | $65 \cdot 5694$ | 5885 | 6077 | 6269 | 6461 | 6652 | 6844 | 7035 | 7227 | 7418 | 760 | 93 |
| 94 | 6611 | 6418 | 6225 | 6032 | 5839 | 5646 | 5453 | 5260 | 5067 | 4874 | 66.4680 | 66．2744 | 2938 | 3132 | 3326 | 3519 | 3713 | 390 | 4100 | 4294 | 4487 | 4680 | 94 |
| 95 | 3703 | 3508 | 13 | 6032 |  | 5646 | 5453 | 5263 | 506 | 4874 | 67．1751 | 66．9795 | 298 | ． 186 | 3326 | 0578 | 0774 | 096 | 1165 | 1361 | 1556 | 1751 |  |
| 96 | 0794 | 0597 | 0400 | 0203 | ${ }^{+006}$ | 9809 | 9612 | 9415 | 9217 | 9020 | 67．8823 | $67 \cdot 6845$ | 7043 | 7241 | 7439 | 7637 | 7834 | 8032 | 8230 | 8427 | 8625 | 882 | 96 |
| 97 | 788 | 7687 | 7488 | 7289 | 7090 | 6890 | 6691 | 6492 | 6292 | 6093 | 68.5894 | 68.3895 | 4096 | 4296 | 4496 | 4695 | 4895 | 5095 | 5295 | 5494 | 5694 | 5894 |  |
| 98 | 4977 | 4776 | 4575 | 4374 | 4173 | 3972 | 3771 | 3569 | 3368 | 3166 | 69.2965 | 69.0946 | 1148 | 1350 | 1552 | 1754 | 1956 | 2158 | 2360 | 2561 | 2763 | 296 | 98 |
| 99 | 2069 | 1866 |  | 1460 | 256 | 1053 | 0850 | 0646 | 0443 | 0239 | 70．0036 | 69．7996 | 8201 | 8405 | 8609 | 8813 | 9017 | 9221 | 9425 | 9628 | 9832 | 4036 | 99 |
| 00 | 9161 | 8956 | 8750 | 8545 | 8340 | 8135 | 7929 | 7724 | 7518 | 7312 | 70.7107 | $70 \cdot 5047$ | 5253 | 5459 | 5666 | 5872 | 6078 | 6284 | 6489 | 6695 | 901 | 7107 | 100 |
|  | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | $5^{\prime}$ | $4^{\prime}$ | 3＇ | $2^{\prime}$ | $1^{\prime}$ | $0^{\prime}$ | $10^{\prime}$ | $9^{\prime}$ | $8^{\prime}$ | $7^{\prime}$ | $6^{\prime}$ | 5 | $4^{\prime}$ | $3^{\prime}$ | $2^{\prime}$ |  |  |  |
| 45 |  |  |  |  |  | INE． |  |  |  |  |  |  |  |  |  |  | S |  |  |  |  |  | $5^{\circ}$ |

## Grifinn's Mining and Metallurgical Works.

ORE AND StONE MINiNG. By Sir C. Le Neve Foster, D.Sc., F.R.S. Sixth Edtiton. Revised and brought up to date by Prof. S. H. Cox, A.R S.M. Fully Illustrated. 28s. net.
the elements of mining and quarrying. By Sir C. Le Neve Foster, D.Sce, F.R.S.S. Second Librtion. Revisen by Prof. S. H. Cox, A.T.S. m. 7s. 6 d , net.

A text-book of coal mining. By Herbert W. Hughls, f.g.s. Fifth Edition. Revised and greatly Enlarged. Fully Illustrated. 24s, net.
PRACTICAL COAL MINING. For those employed in and abont Collieries. With numerons Prohlens arisising from Colliery Practice. By G. L. Kerr, M.E., M.Inst.M.E. Very fully Illustrated. Firtil Empion, Revised aud greatly Enlarged. 12s. 6d. net.
elementary coal mining. For Students, Miners, and Others. By George L. Kerr, M.E., M.Inst.M.E. Turnd Edrion, Revised. Illustrated. 3s. 6 d .

A TREATISE ON MINE SURVEYING. For Managers of Mines and Collieries, Students, ete. By Bexnett H. l.rougit, F.G.S., A.R.S. M. Thirteestin Ention, Revised. 6s, net.
ELECTRICAL PRACTICE IN COLLIERIES. By D. Burns, M.E., M.Inst.M.E. Fourth Edirios, Revised aud Enlarged. With numerous 11 lustrations. At Press.
BLASTING. A Handbook for the Use of Engineers and Others engaged in Mining, Tunnelling, Quarrying, ete. By Oscar Gutranns, Assoe.M.Inst.C.E. Sbeond Fitriox, lievised. 10s. 6d.
testing explosiven. By C. E. Bichel and Axel Larsen. In Medium 8vo. Fully Illustrated. 6s. net.
PUMPING MACHINERY (Steam and Water Pressure). Applied to Mining, Town Supply, Drainage, ete. By Henry Javer, M.Inst.C.E., M.I.Mech.E. Second EDition, greatly Enlarged. With numerous Plates and Illustratious. 21s. net.
INTRODUCTION TO THE STUDY OF METALLURGY. By Sir W. Roberts-Austen, K.C.B., D.C.C.L. F.R.S. Larte 8vo. Haudsome Cloth. Sixtu Editior, Revised thronghout by F. W. Harborn, A.R.S.M.M., F.I.C. 18s. net.
the metallurgy of gold. By T. Kirke Rose, D.Sc., Chemist and Assayer of the Rogal Mint. Furtu Entrion, thoroughly Revised and Enlarged. With Frontispieee and Illustrations. 21s.
THE METALLURGY OF LEAD. By H. F. Collins, A.R.S.M., M.Inst.M.M. Second Edrion, Revised thronghout and Eularged. 21s. net.
THE METALLURGY OF SILVER. By H. F. Collins, A.R.S.M., M.Inst.M.M. Second Edirion, Revised and Enlarged.
the metallurgy of Iron. By Thomas Turnhr, F.I.C., Assoc.R.S.M., Prof. of Metallurgy, Birmingham University. With numerous Illustrations. Large 8vo. Tuird Eviriox, Revised. 16s. net.
THE METALLURGY OF STEEL. By F. W. Harbord, Assoc. R.S.M., F.I.C. With a Section on the Mechanical Treathext of Strel, by J. W. Hall, A.M.Inst.C.E., and numerous Plates and tilustrations. Fourte Edirion, Revised and Enlarged. In Two Volumes. 36s. net.
ALLOYS: AND THEIR INDUSTRIAL APPLICATIONS. By Edward F. Law. In Cloth, with Frontispiece in Colours, and benutiful Series of Photo-mierographs. Second Edirion, Revised. 12s. 6d. net.
ANTIMONY. Its History, Chemistry, Mineralogy, Geology, Metallurgy, Uses, and Preparation, ete. By C. Y. Wana, M.A., B.Sc. 12s. 6d. net,
AssAYING. By J. J. Beringer, F.I.C., F.C.S., and C. Biringer, F.C.S. Thirteenth Edition, Revisel. With Diagrams. 10s. 6 d .
TABLES FOR QUANTITATIVE METALLURGICAL ANALYSIS FOR LABORAtory use. By James Morgan, F.C.S. 4s.
GETTING GOLD : A Practical Treatise for Prospectors, Miners, and Students. By J. C. F. Jounston, F.G.S., A.I.M.E. Timbd Edition, Revised. 3s. 6d.
CYANIDING GOLD AND SILVER ORES: A Practical Treatise on the Cyanide Process. By H. Forbes Julan and Edgar Smart, A.M.I.C.E. Withi Plates, Maps, and Illustrations. Second Edirton, Revised. 21s, net.
THE CYANIDE PROCESS OF GOLD EXTRACTION. By Prof. James Park, F.g.S., M.Inst.M.11. With Frontispiece and Plates. Fourth Enolish Edition, Kevised and Enlarged. 8s. 6d. net.

THEODOLITE SURVEYING AND LEVELLING. By Prof. James Park, F.G.S., M.Inst.M.M. Illustrated. SEcond Edirion, Revised. 7s. 6d. net.

MINING GEOLOGY. A Text-Book for Mining Students and Miners. By Professor James Park, F.G.S., M.Inst.M.M. Third Edition. In Crowi 8vo, Cloth. Illustrated. 6s. net.
PROSPECTING FOR MINERALS: A Practical Handbook. By S. Herbert Cox, Assoc. R.S.M., M.Lust.M.M., F.G.S., etc. Sixtu Editiox. 5 s.

MINING LAW OF THE BRITISH EMPIRE. By Charles J. Alford, F.G.S., M.Inst.M.M. In Crown 8vo, Handsome Cloth. 8s. 6d. uet.

THE MINING ENGINEERS' REPORT BOOK AND DIRECTORS' AND SHAREholdders' Guide. By Edwin R. Field, M.Inst.M.M. Third Eotition. Tocket Size. 3s. 6a.
SPANISH AND SPANISH-AMERICAN, PORTUGUESE AND PORTUGUESEamerican mining, metallurgical, and allied terms (a digtionary of). By Edward Halse, A.R.S.m. In Crown Svo, Cloth. lllustrated. 10s. 6d. net.

LONDON : CHARLES GRIFFIN \& COMPANY, Ltd., Exeter Street, Strand,

# Griffin's Standard Works. 

WORKS BY ANDREW JAMIESON, M.INST.C.E., M.I.E.E., F.R.S.E., ETC.

A TEXT-BOOK ON STEAM AND STEAM ENGINES, INCLUDING TURBINES AND BOILERS.
Seventeentil Edition. With over 850 pages and 400 Illustrations, 16 Ilates, and very numerous questions, including all the Inst.C.E. Exams. on Theory of Meat Engines, in Lectures, etc. 10 s . 6 d .

## APPLIED MECHANICS AND MECHANICAL ENGINEERING:

Covers the following sections, iuto which Applied Mechanics is divided by the London University and the Inst.C.E., with ald the Exam. Questions ever set by the latter in the suljeets which form the titles of the volumes: Vol. I.Appled Mechanies. Eighth Edition. Pp. i-xviii +400 . 6s. Volume Il.-Strexgth of Materials. Eighth Edition. Pp. i-xviii +264 . 5s. Volume 1II. -Theory of Structures. Eighth Elition. Pp. i-xviii +232 . 5s. Volume IV.-Hydraulics. Eighth Edition. Pp. i-xvi +274 . 5s. Volume V.-Tubory or Machines-Seventh Edition. Pp. $\mathrm{i}-\mathrm{xx}+502$. 7s. 6 d .

## WORKS BY W. J. MACQUORN RANKINE, LL.D., F.R.S., <br> Late regius professor of civil engineering in tile university of glasgow.

Thornughly Revised by W. J. MILLAR, C.E., late Secretary to the Institute of lingineers and Shipbuitders in Scotland.

## A MANUAL OF APPLIED MECHANICS:

Comprising the Principles of Staties and Cinematics, and Theory of Structures, Mechanism, and Machines. With Numerous Diagrams. Crown 8vo, cloth. Eighteenth Edition. 12s. 6d.

## A MANUAL OF CIVIL ENGINEERING:

Comprising Engineering Surveys, Larthwork, Foundations, Masonry, Carpentry, Metal Work, Roarls, Railways, Canals, Rivers, Waterworks, Harbours, etc. With Numerous Tables and Illustrations. Crown 8vo, cloth. Twesty-Fourth Edition. I6s.

A MANUAL OF MACHINERY AND MILLWORK:
Comprising the Geometry, Motions, Work, Strength, Construction, and Objects of Machines, etc. Illustrated with nearly 300 Woodeuts. Crown 8vo, cloth. Seventh Edition. 12s. 6d.
A MANUAL OF THE STEAM ENGINE AND OTHER PRIME MOVERS:
With a Section on Gas, Oil, and Air Engines, by Bryan Donkin, M.Inst.C.E. With Folling Plates and NumerousIllustrations. Crown 8vo, cloth. Seventeenti Fdition. 12s. 6d.

> USEFUL RULES AND TABLES:

For Architects, Builders; Engineers, Founders, Mechanics, Shipbuilders, Surveyors, etc. With Appendix for the use of Electrical Engineers, by Professor Jamieson, F.R.S.E. Eighth Edition. 10s. 6d.

## A MECHANICAL TEXT-BOOK:

A Practical and Simple Introduction to the Study of Mechanics. By Professor Rankine and E. F. Bamber, C.E. With Numerons Illustrations. Crown $8 v o$, cloth. Fifth Edition. 9s.
** The "Mechanical Text-Book" was designed by Professor Rankine as an Introduction to the above Series of Manuals.
WATER SUPPLY: A Practical Treatise on the Selection of Sources and the Distribution of Water. By Reonnald E. Mindleton, M.Inst.C.E., M.Inst. Mech.E., F.S.1. With Four Folding Plates and Numerons Illustrations. Price By Reorna
8s. 6 d . net.
BONUS TABLES. For Calculating Wages on the Bonus or Premium Systems. For Engineering, Technical, and Allied Trades. By Henry A. Golding, A. M.Inst.M.E., Technical Assistant to Messrs Bryan Donkin \& Clench, Ltd., and Assistant Lecturer in Mechanical Engineering at the Northamptou Iustitute, London, E.C. In large 8vo, cloth boards. With Thumb Index to facilitate Reference. 7s. 6d. net.
MINE ACCOUNTS AND MINING BOOK-KEEPING. For Students, Nanagers, Secretaries, and others. By James Gunson Lawn, Assoc. R.S.M., Assoc. M.Inst.C.E., F.G.S. Edited by Sir C. Le Neve Foster, D.Sc., F.R.S. In large 8vo. Seyentia Edition. Price 10s. 6al.
A POCKET-BOOK OF ELECTRICAL RULES AND TABLES. For the use of Electricians and Engineers. By John Musho, C.E., and Prof. Jamieson, M.Inst.C.E, F.R.S.E. Nineteenth Edition, Revised and Enlarged. With Numerous Diagrams. Poeket size. Leather. 8s. 6d.
STEAM BOILERS: Their Defects, Management, and Construction. By R. D. Munro, Chief Engineer of the Scottish Boiler Insurance and Engine Inspection Company. Fountri Enition. Very fully lllustrated. Cloth, 4s. 6d.

WORKS BY PROF. ROBERT H. SMITH, Assoc.M.I.C.E., M.I.M.E., MI.I.E.E., M.I.Min.E., Whit.Sch., M.Ord. Meiji.
THE CALCULUS FOR ENGINEERS AND PHYSICISTS, applied to Technical Problems. With Hxtensive Classified Reference List of Integrals. By Prof. Robert H. Smitir. Second Edition, Revised. In crown 8vo, extra, with Diagrams and Folding Plate. 7s. 6d. net.
MEASUREMENT CONVERSIONS (English and French): 28 Graphic Tables or Diagrams. Showing at a glance the Mutual Conversion of Measurements in Different Units of Lengths, Areas, Volumes, Weights, stresses, Showing at a glance the Mutual Conversion of Measurements in Different Units of Lengths, Areas, Volumes, Weights, stresses,
Densities, Quantities of Work, Horse Powers, Temperaturcs, etc. For the nse of Engineers, Surveyors, Architects, and Contractors. Densities, Quantities
In 4to, boards, 7 s . 6 ll .
THE MECHANICAL ENGINEER'S REFERENCE BOOK. A Handbook of Tables, Formulx, and Methods for Enginecrs, Stndents, and Dranghtsmen. By Henry Harrison Suplee, B.Sc., M.E. Third Edition. In Pocket size. Leather, on special Thin Paper. Pp, i-xii 4834 . Price 18s, net.
THE EFFECTS OF ERRORS IN SURVEYING. By Henry Briggs, M.Sc. In Handsome Cloth. Pp. i-xi+179. Fully Illustrated. 5s. net.


